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VOL. XXI. No. 8

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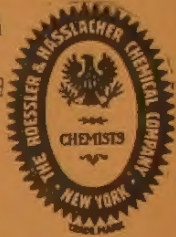
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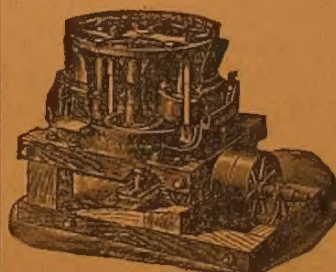
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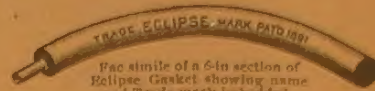
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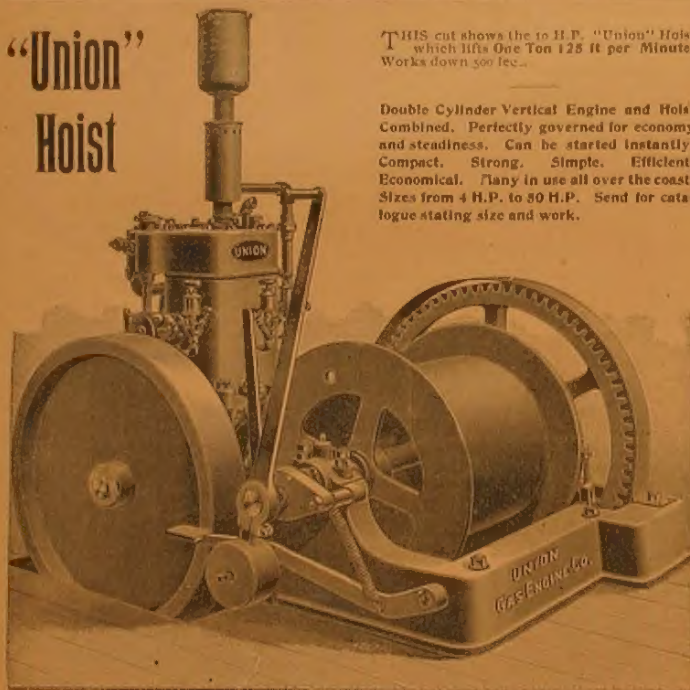
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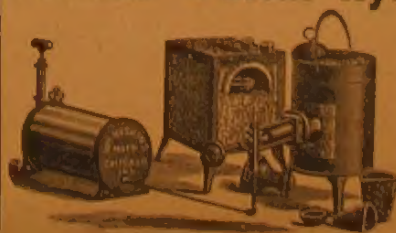
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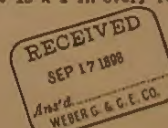
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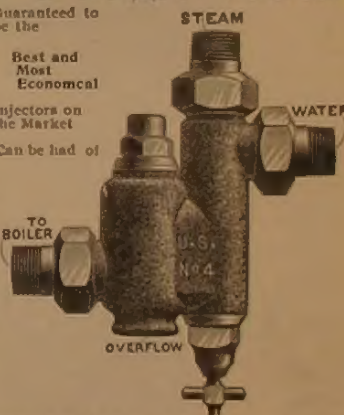
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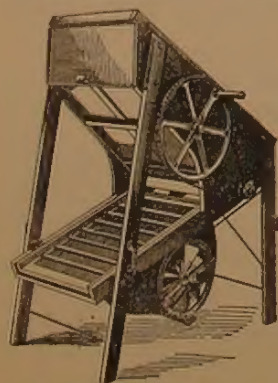
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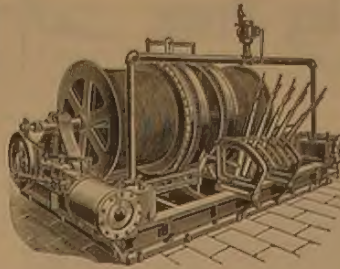
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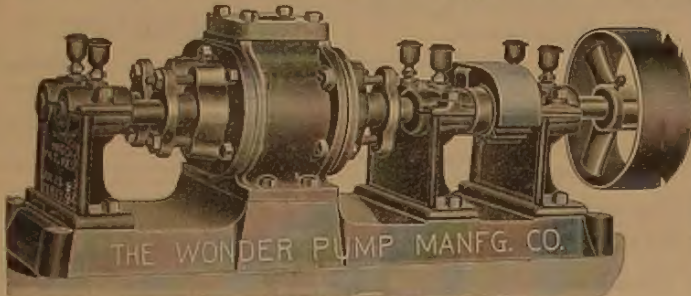
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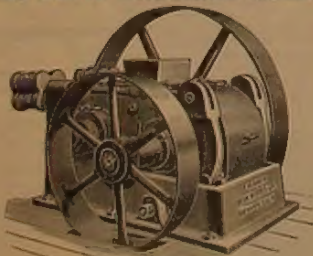
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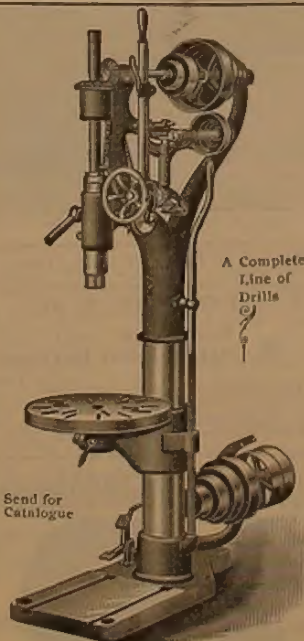
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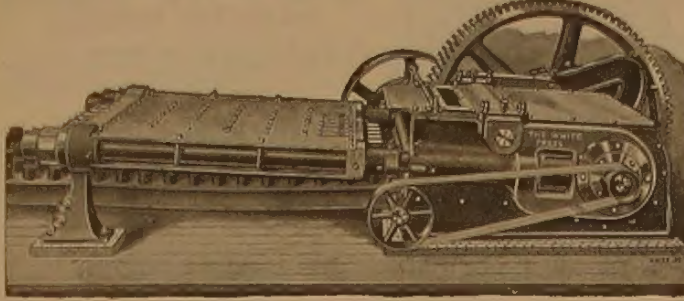
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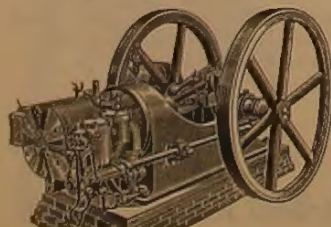
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(1991年10月1日)

ADVERTISING RATES FURNISHED ON APPLICATION.

NATIONAL FORESTRY CONVENTION.

The American Forestry Association, of which Hon. Jas. Wilson, Secretary of Agriculture, is president, will hold its annual sessions for 1899, embracing a series of interesting meetings, under the auspices of the Forest and Water Association of Los Angeles County, at the Assembly Hall, 330 South Broadway, Los Angeles, California, on the following dates:

WEDNESDAY EVENING, JULY 19th, 8 P. M.

Address of welcome by Stephen M. White.
Responses by eminent officers of the National
Association. Illustrated lectures by F. H.
Newell and J. B. Lippincott.

THURSDAY AFTERNOON, JULY 20th, 2:30 P. M.

Papers on the protection of forest reserves, the storage of water at river sources and the reclamation of arid lands.

THURSDAY EVENING, JULY 20th, 8 P. M.

Illustrated lecture by Gifford Pinchot.

During these sessions, addresses by distinguished speakers will be given, with Geo. P. Whittlesey, of Washington, D. C.; Hon. Geo. H. Maxwell, of San Francisco, Cal.; Representative R. J. Waters, of the 4th Congressional District of California; Fred Eaton, Mayor of Los Angeles, Cal.; President Geo. W. White, University of Southern California; City Engineer of Los Angeles, Frank H. Olmstead; Engineers J. D. Schuyler and H. Hawgood; T. S. Van Dyke, author and traveler, and Hon. Abbott Kinney, Commissioner of Yosemite Park and President of the Southern California Academy of Sciences, participating.

GIFTS IN AID OF SCIENCE.

When we read of large amounts donated by people of wealth to Universities and Colleges, the extent of the gift is easily comprehended by every one, but in the case of the bequest or gift of a large collection of minerals or fossils to such institutions by enthusi-

astic collectors, which represent the work of a whole lifetime, the true value of such a gift is not always appreciated, except by those who have made such a collection.

Probably the most important scientific gift received by Yale in its history, aside from the collection of specimens representing the life work of Prof. Marsh, was announced. It was the entire scientific collection of Prof. Charles Emerson Beecher, who was for years associated with Prof. Marsh, and was two weeks ago made Prof. Marsh's successor. Prof. Beecher gives his invaluable collection

He says: "These collections were made previous to my coming to New Haven, and represent the results of twenty years' labor. They were collected wholly by me in the field and at my own expense, and comprise upward of 100,000 specimens, mostly of invertebrate fossils."

Every mine owner or manager has it in his power to collect valuable and beautiful mineral specimens from time to time in the course of operating a mine, and it ought to be their habit to collect such interesting objects as will advance the cause of science and education. If they do not desire to save on their own account, such rare or beautiful minerals should be sent to the State Mining Bureau, or to the Chamber of Commerce of their district, where they will attract public notice, or to a University Museum, where they will give instruction. Such specimens donated in this way, and properly marked as to scientific and common name of the mineral, together with the name of the mine and district, are a good means of attracting attention to the resources of your neighborhood, and at times of advancing your own interests.

INSPECTION OF MINING CORPORATIONS.

The recent advance in the price of copper has so stimulated the demand for copper investments that the legitimate promotion of copper mining companies has become a craze in all parts of the United States, as well as in other countries. To such an extent has this boom been operated that in all directions there have arisen an undesirable flood of fake or copper mining schemes. Mere prospects have been placed before the public under the designation of mines, and have been incorporated as stock companies, by parties who have made false representations and reports which are liable to mislead the investors. This condition of affairs is a detriment to the mining industry, as it throws a feeling of doubt or suspicion on such enterprises as are of merit and worthy of the investment of capital.

To suggest a remedy, with the object of making mining stock company enterprises a safe investment for the public is the most important measure which the industry requires at the present time.

Before any new mining company is granted articles of incorporation, the property or mines of such company should be reported on by the inspector of mines of the state in which it is located, to establish the truth of the statement made in the prospectus and reports. The promoters of the scheme paying for such official inspector's expenses, (but not for salary or fee to him) in addition to their own mining engineers' reports. An office of inspector of mines would then have a double value to the state. If no company was granted incorporation without first receiving such inspection and official guaranty, it would become impossible for fakes and

frauds to be presented to the public as legitimate mining enterprises. This is a matter in which the California Miners' Association can confer a benefit on the industry in securing the necessary changes in our laws to make the measure effective.

In the case of a sale between a private owner and one seeking to purchase a mine, such official inspection is not necessary, as the purchaser can consult his own mining engineer, but in the case of selling stock to the public, no such examination is asked or granted in all cases, and the stock of new mining companies ought to have the official guaranty of honest representations and intentions to give them value. We have insurance company inspectors and bank inspectors, but the mining industry is not protected against fraud.

THE AUTOMOBILE FOR THE WEST.

The horseless carriage having obtained a place among the traveling conveniences of city life, it is only a question of time as to how soon the automobile or autotruck will be made for hauling ore for mines to distant lines of railway. The rapidly extending use of electricity at many mines makes their introduction possible in the first instance, and as the power in such a case would be supplied at the mine, a great saving in hauling, feed for horses and mules would be effected. Water is required in the case of steam traction, but with electric power haulage it is not, and for that reason it presents an economical means of hauling in the desert districts, where it could be used at all seasons of the year. As thirty to forty miles can be traveled without recharging the storage batteries, a sixty to eighty miles haul could be made by having extra batteries on board.

The rate of speed would depend more on the condition of the road than anything else, as sixteen miles an hour can be made with light passenger carriages. The ease with which they can be guided and controlled to stop within fifteen feet of the point where the brake was applied, renders them safe and suitable for even hilly districts. For stage lines to mining districts, the automobile presents a fast and safe means of transit.

It is claimed that the cost of motive power is only one and one-fourth cents per mile for light carriages for passengers, so that where an electric plant is used, it would cost less than feeding horses. At these figures, there is a sure market in the southwest for such conveniences for both freight traffic and passenger travel, and forms a valuable feeder to railway lines.

PROSPERITY.

It is what everybody wants and hopes for. There are two kinds of prosperity—general and limited, and whether times are good or not depends upon the standpoint from which one judges. Every person who is doing well, that is, adding to his wealth in whatever vocation he is engaged, will say that times are prosperous. There is so much egoism in human nature that but a small minority look beyond personal interests and take the trouble to inquire into how others are getting along.

There are optimistic people who, from slight evidence, conclude that prosperity is widespread, if not universal, or who easily work themselves into the belief and expectation that, if it is not, it is surely about to be so.

The business conditions in a country have

ing much to do with political results, on one side there is optimism and on the other pessimism, each side endeavoring to make it appear that the view it takes is to be credited to it, if it be favorable, and, if otherwise, it is chargeable to the other side. It requires impartiality of mind to see conditions precisely as they are.

The fact that our exports are largely in excess of our imports, is taken as an evidence of general prosperity, and it does prove that the nation is benefited by drawing money from other countries, which is of no inconsiderable importance. It is said that in the last year \$360,000,000 of American securities held abroad have been paid off, or have been bought and brought home. This is important, as it avoids the payment of interest to foreign people. But no account is taken of the facts that at the same time we have been paying an immense sum to foreigners for doing our transportation, and expending \$100,000,000 annually for traveling and sojournment abroad in excess of what foreigners spend in this country. The balance of trade does not pay these sums, and the interest and dividends on foreign capital invested in this country. There cannot be the highest prosperity till American enterprises are conducted with American capital.

At the present time, certain facts, which relate to one industry or a few lines of business, are presented as proof of prosperity, and the conditions of other industries are left unnoticed. For instance, there is much said about the tremendous demand for iron and steel products, and the enormous increase of prices. It is prosperity to the owners of the plants and agencies of production. While prices have advanced 40 or 50 per cent, they have increased wages 10 to 20 per cent, which assures to the capitalists an enormous profit, and consequently they aver that there is phenomenal prosperity. This is limited and not general prosperity.

On the other hand, what is it to consumers? It cannot be said that it promotes their prosperity to have to pay for what they need 40 or 50 per cent more than previously. It is not necessarily prosperity of a general character because the price of one or a few commodities goes up. Real prosperity is when in the general range of commodities prices relatively or co-ordinately advance, and when wages are proportionately increased. In a few other industries or enterprises there are increased activities, but they constitute but a small part of the whole.

There has of late been a slight increase in the price of wheat, in prospect of reduced production for the current year, and that foreign demand will not be above the ordinary, but the price of wheat is nearly 40 per cent below what it was eighteen months ago, and it does not yield a profit above the cost of production, taking into account land rentals and the labor of the land owners. The same is true of the other cereals, cotton, and of agricultural products in general.

Producers and consumers are in everlasting antagonism, and what is sport for one is death to the other. Unless the business in which consumers are engaged yields adequate profits, to enable them to meet the increased cost of what they have to purchase, prosperity is one-sided. We repeat, therefore, that general prosperity can only be when generally capital and labor receive the remuneration which they are justly entitled to, and no more. It is not the fostering of a class, but the mass, that makes prosperity.

In the largest measure, industrial growth

of late has been brought about by combinations and trusts, and from the employment of fictitious capital, which is not proof of permanent prosperity, but is the harbinger of disaster rather. These combinations may cheapen production, through the introduction of what they call economies, but their methods will have the effect to increase the army of enforced idlers, and in time, through regulation of production, and control of the agencies of distribution, they will have it in their power to oppress laborers and consumers alike, then there will be partial prosperity and general distress.

THE TIMBER AND STONE ACT.

The part of this Federal statute, which relates to stone claims, is intended to grant ownership to miners or quarrymen by their paying the price put on such land at \$2 50 per acre. The General Land Office circular quotes as follows:

"The Act of June 3, 1878, (20 Stat. L. 89; Appendix No. 6 p. 147) provides for the sale of timber lands in the States of California, Oregon, Nevada and Washington, and the Act of August 4, 1892, section 2 (27 Stat. L. 348; Appendix No. 52 p. 214), extends the provisions of the former Act to all the public-land States.

1. The quantity of land which may lawfully be acquired under said acts, by any one person or association, is limited to not exceeding 160 acres, which must be in one body.

2. The land must be valuable chiefly for timber (or stone) and unfit for cultivation, if the timber were removed.

3. It must be unoffered, unreserved, unappropriated and uninhabited, and without improvements (except for ditch or canal purposes), save such as were made by or belong to the applicant.

4. Lands containing valuable deposits of gold, silver, cinnabar, copper or coal, are not subject to entry under this act.

5. One entry or filing only can be allowed any person or association of persons, etc., etc.

6. A person applying to purchase a tract, under the provisions of this act, is required to make affidavit before the register or receiver that he has made no prior application under this act, etc., etc.

This last section shows clearly that only one entry or claim for stone can be made under the act as it reads at present, and that it limits the industry of quarrying in doing so. If it limited to only one claim in a township or district for the same class of stone to each individual or company, that restriction would prevent any monopoly, which is seemingly the object intended.

In the case of a miner or quarryman who has taken up one claim under the act for stone of a certain kind, as granite, he cannot take up a claim in another district for stone of a different kind, as slate or flagstone, and thereby is industry retarded. There can be no objection to a party working more than one class of stone, or claims of a different kind, under this act, hence the need of a change in the case of Sections 5 and 6, as relating to stone claims.

To ADVANCE the mineral industry of Utah has been the policy of the Rio Grande Western Railway, (the Great Salt Lake route) in years past, and is now. The literature they have published regarding Utah would make a most valuable collection. The latest thing out is a description of the mining districts of Utah. It is in pamphlet form, and contains

60 pages of well written matter, and is illustrated with pictures of the different mines and camps. In addition to the 60 pages mentioned, there is a Prospectors' Map of Utah, showing all the districts, supplementing this are topographical maps, showing every recorded claim of the Tintic Mining District, West Mountain Mining District, Bingham, Camp Floyd Mining District and West Dip of Mercur. As a whole, the pamphlet is a most valuable guide to the properties and districts of Utah, and we admire the pluck and energy displayed by the Rio Grande Western Railway Company.

The Electric Furnace.

The intense heat generated by an electric arc, in a suitably designed enclosure, has made it possible to produce new substances, or substances which could be obtained through no other process. Some of these are calcium carbide, from which acetylene gas is made, barium and strontium carbides and carbon boride. Another product of the electric furnace of more recent date which should prove commercially useful, is silicon carbide, which, owing to its extreme hardness, is well adapted for cutting, polishing and grinding, and may, it is thought, supersede corundum, now being used to a large extent for such purposes. Probably the most interesting experiment however, although of least commercial value, that owes its origin to the electric furnace is the making of artificial diamonds. Prof. Moisson of Paris, the well known experimenter, spent years working on this problem, and established the fact that pressure as well as intense heat was necessary in their manufacture, and in this connection some experiments recently made by Prof. Tucker, of Columbia University, are extremely interesting, and of no little importance from a scientific standpoint. Some time ago Prof. Moisson, by means of a specially devised electric furnace, succeeded in making artificial diamonds, the largest however not measuring much over forty-thousandths of an inch in diameter. The heat then generated, the most intense ever produced up to that time, was about 6,300 degrees Fahrenheit, whereas, if reports are to be credited, Prof. Tucker succeeded recently in obtaining a heat of between 6,500 and 6,700 degrees. The principal aim of the experiment was to determine the commercial value of the extreme heat obtainable from an electric arc, and with this object in view a special furnace was devised which is said to be an improvement over that made use of by Prof. Moisson.

Artificial diamonds were made by Prof. Tucker in much the same manner as those made by Prof. Moisson before a New York audience some three years ago, namely, by placing cast-iron chips in a plumbago crucible and covering them with carbon. The whole was then subjected to the full heat of the furnace, after which the crucible and its contents were withdrawn and plunged into icy water, the sudden contraction of the molten iron furnishing the necessary pressure for crystallizing the carbon. The experiment is said to have been very successful in that a diamond larger than any so far made was produced. Aside from this fact, the experiment was interesting, as showing the enormous heat which may be produced by the electric furnace, probably the most intense yet obtained, and which should ultimately be the means of reducing the cost of production of certain substances, such for example as calcium carbide, now in demand for commercial purposes.

THE SELF-COOLING CONDENSER.*

(BY THOMAS L. WILKINSON.)

I doubt very much whether the number of condensers used in this State of Colorado exceeds half a dozen.

There may be several reasons for this. First: the natural water supply is limited, or, at best, very irregular, and so cannot be depended upon. Second: the added cost of condensers in connection with steam plants. Third: the small amount of manufacturing done here, as compared with the East, where competition is much stronger, and cost of production is a prime factor. As this city and state continue to progress, industrial pursuits will of consequence expand. Manufacturers will seek means of lowering their cost of production. Their power must cost less, or they must get more out of it.

Mr. F. W. Dean, in his paper before the Am. Soc. Mech. Engrs., in December, 1897, on "The Reduction in Cost of Steam Power from 1870 to 1897," says:

"Considering economies effected, it is safe to say that, without including triple-expansion engines, steam economy has steadily decreased from 20 pounds to 12½ pounds per indicated horse-power between 1870 and 1897. This corresponds to a saving of

$$\frac{20 - 12\frac{1}{2}}{20} = 37\frac{1}{2} \text{ per cent.}$$

"It will in general be observed, however, whatever may be said of other causes, that most of the extreme cases of economy are those in which a good vacuum has been maintained."

A non-condensing engine cannot do work by expansion economically, below atmospheric pressure, and, when exhausted against the atmosphere, a back pressure results. The use of the condenser is here apparent. The condenser removes the back pressure, and so more work may be done on the steam side of the piston, and the pressure becomes effective down to nearly the zero point.

Condensed steam occupies about 1-16000 of its former volume. In the jet condenser steam is condensed by coming in contact with a jet or spray of cold water. Here condensation is instantaneous. In the surface condenser, the steam to be condensed is passed through tubes, about which cold water passes, or the cold water circulates through the tubes, and the steam comes in contact with the outside of the tubes and is instantly condensed. The total cooling surface is about one half that of the boiler heating surface.

"At sea it is found that the surface condenser, while adding 10 to 15 per cent. to the first cost of the engine, saves from 15 to 25 per cent. to the first cost of the fuel as compared with engines fitted with jet condensers increases the durability of the boilers, if they are intelligently managed, very greatly, and gives some incidental advantages. The air pump is made half as large as with jet condensers; but the necessary addition of a circulating pump more than compensates that gain."

Common practice establishes the volume of the jet condenser from 1/3 to 1/2 that of the steam cylinder. The proportion should be made to depend on the weight of the steam

PERCENTAGE GAINED BY CONDENSING.

TYPE OF ENGINE.	FEED WATER PER INDICATED HORSE-POWER PER HOUR.				PER CENTAGE GAINED BY CON- DENSING.
	Non-Condensing.		Condensing.		
	Probable Limits.	Assumed for Comparison.	Probable Limits.	Assumed for Comparison.	
Name	Lbs.	Lbs.	Lbs.	Lbs.	
Simple High Speed.....	35 to 26	33	25 to 19	22	33
Simple Low Speed.....	32 to 24	29	24 to 18	20	31
Compound High Speed.....	30 to 22	26	24 to 16	20	23
Compound Low Speed.....		*	20 to 12¾	18	25
Triple High Speed.....	27 to 21	24	23 to 14	17	29
Triple Low Speed.....			18 to 12¾	16	

discharged into it at each stroke; it is larger in small and fast-running engines.

The amount of water that is used to do the work of condensation in an engine varies; but depends on the total heat and weight of the steam and the temperature of the injection water. If a good vacuum is maintained, say 26 inches, and the injection water does not exceed 70°F., from 25 to 30 times the amount of feed water entering the boilers, will be required to do the work of condensing the exhaust steam from the engine.

With 70 pounds boiler pressure the gain would be:

POINT OF CUT OFF	PER CT. GAINED BY VACUUM
1/2.....	16.5
2/3.....	20
3/4.....	24
1-5th.....	27.5
1/6.....	30

This per cent. of gain in fuel is about double the per cent. of gain in power due to the vacuum. Thus, with 70 pounds boiler pressure, the difference shown by the use of the condenser would have the effect of reducing the point of cut-off from 1/3 to 1/4.

The above table shows the percentages gained by the use of the condenser used in connection with different types of engines.

The lack of a sufficient natural water supply, or the large expense in obtaining it for condensing purposes, has been the greatest drawback to the introduction of condensers.

When we consider that twenty-six times as much water is needed for condensing steam as is pumped into the boilers, it naturally follows that, unless a large supply of cheap water is to be had, the engines must be run non-condensing.

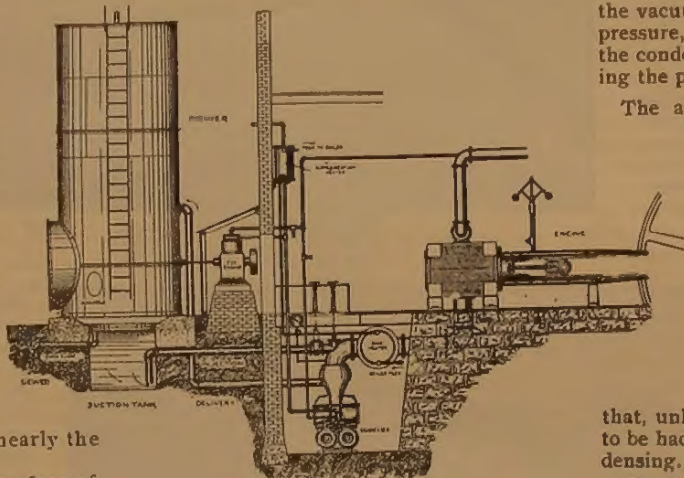
The fuel economy is so generally well understood, by the use of the condenser, that the problem of condensation without a large water supply has been pursued by engineers, in the hope of a still further saving, with more or less success.

Many schemes have been devised to reduce the amount of cooling water used, as well as to cool the water used, but only with crude success.

In some of these cases the heated water of condensation was delivered into a pond to be used over again, when cool. Shallow pans in great numbers have been placed near the engine room, in racks or tiers, and also on the roof. Large surface is required, but this is a slow process, and time for cooling depends much on the temperature of the surrounding air and the winds. Yet another way was to pump the hot water over piles of brush, thus breaking the stream into finer ones, and exposing considerable surface to the action of the air.

Experiments were made by the late James H. Fitts of Virginia, the results of which were read before the American Society of Mechanical Engineers, in November, 1892, and were in reference to an evaporative surface condenser.

(To be Continued.)



SELF-COOLING CONDENSER.

Given:

I=Temperature of injection water.

D=Temperature of discharge water.

S=Total heat of the steam as it leaves the engine.

This may be taken at 1150 B. T. U.

Then: S-D

—=unit weight of injection
D-I water required per
unit weight of steam.

Example: I=70°F.

D=110°F. with vacuum of 26 inches.

S=1150 units of heat.

Therefore: 1150-110

—=26, which means that

110-70 26 times as much

condensing water is required as is being pumped into the boiler.

The advantage gained in horse power with 90 pounds of steam is as follows:

POINT OF CUT-OFF	PER CT. GAINED BY VACUUM
1-5th.....	11
1-6th.....	12
1-8th.....	14.7
1-10th.....	17
1-12th.....	20

*Paper read before a meeting of the Colorado Scientific Society at Denver.

CABLE HOIST CONVEYOR.

The Hall Patent Cable Hoist Conveyor is especially adapted to transporting tailing and other material from mine to mill. It can be erected so that its removal from one place to another is easily accomplished.

One end of the track cable is fastened to a ring at the top of the power-station mast, and the other end, after being passed through a block attached to the top of the other mast, is secured by a hemp-rope tackle to a "dead-man," tree or stump. The hemp-rope tackle serves the purpose of stretching the track cable to the proper tension for work, or letting it out during the operation of shifting.

The preferred form of engine is one with double cylinders, three drums placed tandem fashion, and an upright boiler, all mounted on one bed-plate.

The drums are set in slightly different elevations, or in steps, as in the usual arrangement of hoisting engines of this type, the back drum being the highest, and the forward drum the lowest, in order that the ropes from the middle and back drums may not interfere or come in contact with the drums over which they pass. The drums are driven independently of each other through friction connections, operated by hand-levers, and are also fitted with brakes operated by treadles.

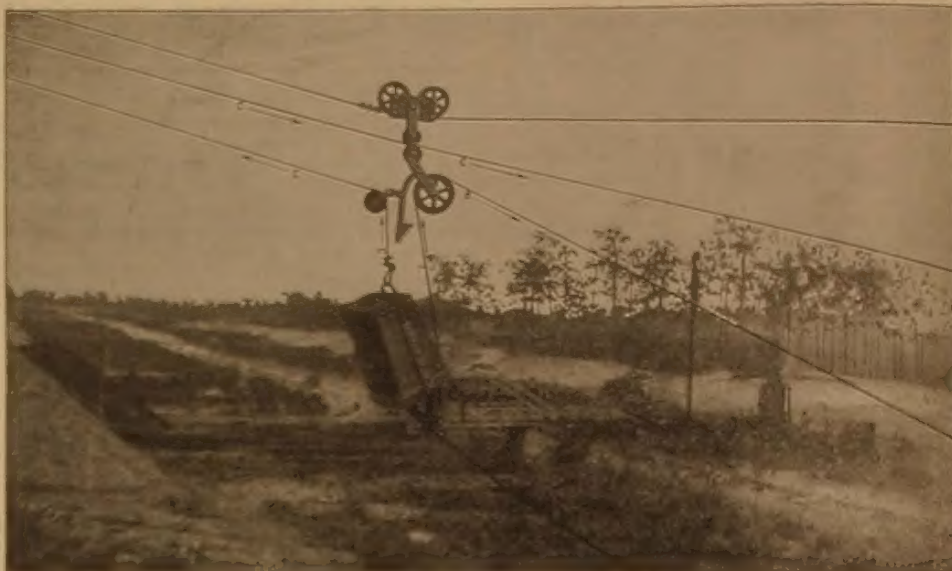
The rope from the back drum, which is used in the operation of loading the bucket, and is known as the loading rope, A, (see illustration), passes through a block at the top of the power-station mast, thence through a similar block anchored to a dead-man in the bottom of the material to be removed

block at the foot of the power station mast, thence between idler wheels in the hoist carriage to a block at the top of the outer terminal, through this to a block attached to the carriage, and thence to a link on the bottom of the bucket in the middle of one side.

The carriage consists of a pair of iron side plates, between which are two upper sheaves that transverse the carrying cable and a lower sheave around which the hoisting rope passes. The block, through which the out-haul rope passes, is attached to the hook-link.

The bucket tapers from the top down, and

The operation is as follows: Starting with the bucket in the far edge of the material, directly under the cable line, and lying on one of its flat sides (it matters not which), the loading rope is put into action, dragging the bucket horizontally along the bottom until it scrapes itself full, when the engineer places his foot gently upon the treadle connecting with the brake of the loading drum, throwing out the power friction at the same time, and applying power to the hoisting drum, also just enough power to the out haul drum to keep up the slack of the out haul rope.



HALL PATENT CABLE HOIST CONVEYOR, SHOWING CARRIAGE AND BUCKET.



CABLE EXCAVATOR AND CONVEYOR BUILT FOR THE HARQUA HALA GOLD MINING CO., HARQUA HALA MINE.

at a point some distance from the cable line, and thence to a fastening on the bail of the bucket. The rope from the center drum is used for hoisting, also for hauling in, and is known as the hoisting rope, B. It passes through a block at the foot of the power station mast, and thence around a sheave in the hoist carriage to a fastening on the bail of the bucket.

The rope from the forward drum is used in hauling the carriage out, and is known as the cut-haul rope, C. It passes first through a

in shape is that of a truncated wedge. The bail is rigidly fastened to the body, and the link to which the end of the out-haul rope is fastened, as already stated, is at the bottom edge in the middle of one of the flat sides, the position of which is quite important, as will be better understood when we describe the operation of dumping. The upper plates on the flat sides are of crucible steel drawn to a knife edge, so that the bucket may plough or cut its way readily through the material to be excavated.

The object of applying the brake to the loading drum is to bring the bucket into a vertical position before hoisting, and thus prevent the load spilling. As it comes back under the line, the engineer releases the brake on the loading drum, and allows the loading rope to run slack. The bucket is raised sufficiently to clear all obstacles under the line, when the engineer applies the brake to the hoisting drum, simultaneously throwing out the power friction on the same, and applying power hard to the out-haul drum. The bucket moves out above the desired position and continues to rise at the same time, by reason of the hoisting rope being held taut, which is necessary to keep the bucket from turning upside down.

When the bucket reaches the desired elevation, it engages a latch and the brake on the hoisting drum is released. A bumper on the track cable stops the carriage and prevents the bucket from dropping in the act of discharging.

When the carriage reaches a point within two or three feet of this bumper, the steam is shut off from the engine, the power being still applied to the out-haul drum, and the brake taken off the hoisting drum, when the bucket swings back and at the same time turns upside down. It does so with a great jerk, which very effectually clears it of its contents, but to insure a good discharge every time, it is important that the bucket should fall flat side horizontal, and hence the reason for placing the link to which the out-haul rope connects, in the middle edge of one of the flat sides. After dumping, the power is taken off the out-haul drum and

the brake gently applied; the steam is turned on, and power applied to the hoisting drum. When the bucket reaches a certain point the power on the hoisting drum is taken off, the bucket drops and at the same time moves forward, till it reaches the center of the material,



FIG. 1.

when a bumper on the track cable similar to the one over the dump arrests the motion of the carriage, and the bucket drops vertically into the canal. During this operation sufficient power is applied to the loading drum to take up the slack of the loading rope.

A modified form of the Hall rig was built for the Harqua Hala Gold Mining Company, of Harqua Hala, Arizona, to work a bed of tailings, as shown on page 10. This bed, including both the old and new tailings, covered a considerable and irregular area of ground, there being about 120,000 tons to be delivered to the leaching vats, at the rate of 150 tons per day, representing about three years' work. The problem was not only to hoist and convey this amount of material, but to build a line that would also be self-digging and portable; or, in other words, a line with a self filling bucket, and with supports that could be moved radially about a stationary end support at the leaching vats, so as to work over the whole area without requiring hand labor. A further condition was that the line must be adapted to work in varying lengths, on account of the irregular shape of the bed, the longest distance being 825 feet.

The main trackway for the carriage consists of a $\frac{3}{8}$ inch steel Patent Locked Wire cable laid double; that is, at the stationary end tower, just behind the bins near the leaching vats, it passes around a sheave in a shackle, which is securely connected to a ground anchorage, and is stretched out over the two end towers and intervening supports in two parallel lines; one end of the rope is rigidly fastened at the back of the movable end support, and the other end is coiled on a drum worked by a ratchet, sufficient cable being provided so that it can be paid out or wound up on this drum to suit the varying lengths in moving to different positions. The movable end support is firmly secured by guy ropes to posts.

Below the carriage hangs the bucket of one ton capacity, which is practically the same as that used on the Hall rig, and is operated by three ropes in a similar manner. The loading rope in this case, however, works parallel with the main cable instead of at right angles to it. This rope is attached directly to the

hail of the bucket, and the main cable, therefore is relieved from all strain during the loading operation, which is the heaviest part of the work. The three ropes pass over sheaves at the top of the stationary tower in a pivoted shackle, which accommodates itself to the different angles at which the ropes must work, these ropes only being affected by the varying lengths of the line so far as to alter the amount of unused portions on the drums.

It is understood this plant has accomplished the purpose for which it was built, and is not now in operation.

CALKINS' AUTOMATIC FED CUPEL MOLD.

There are two requisites to good work in assaying after the use of correct balances, and these are a good crucible and a properly made cupel, for without these will be loss and failure. Mr. A. C. Calkins, of Messrs. B. M. Calkins Co., assayers and analytical chemists, Los Angeles, Cal., who was the inventor and patentee of the L. & C. assayers' furnace, which has proved its merit to all who tried it, is also the inventor and patentee of the Automatic-Fed Cupel Mold.

With this valuable addition to the laboratory, the assayer can easily make six hundred



FIG. 2.

cupels of perfect and uniform size and density in one hour. Every assayer knows the objections to the old style of driven cupel made by hand, which is never uniform either in size or compression, and that as a consequence of this a large percentage of them fissure and check in the muffle. The hand-made cupels are built on the principle of a bale of hay, and consist of a succession of flakes, the first layer being formed by the first blow on the die, and each successive blow adds flake after flake. Cupels made in this machine by steady compression are a homogeneous mass and neither check nor fissure. Figure 1 shows the machine at the beginning of the compression.

The bone ash properly moistened is put into the hopper which feeds the machine. There is a small wheel in the hopper which bears on the top disk and is thus rotated as the machine is worked; it prevents the moist bone ash from bridging in the hopper and insures absolutely perfect feed. The machine consists of a compound lever of ingenious construction, a plunger or die and two disks. The top disk contains the holes in which the the cupel is compressed, and the bottom disk is a plane plate with but one hole somewhat larger than in the disk above. After making the compression the bottom disk is rotated

until the hole is in line with the hole in the disk above, in which the cupel has been compressed. Figure 2 shows the machine as the cupel is being discharged into one hand while the operator continues the downward stroke of the lever.

Figure 3 shows the machine when the cupel has been discharged. The machine is compact and powerful and of good workmanship, and is so constructed as to admit of more or less compression by simply adjusting the jam nuts holding the lever apparatus in place.

This valuable labor-saving invention only requires to be known by assayers to be appreciated, and forms a great step in advance in saving time and avoiding loss and cannot well be dispensed with where a large number of assays are required, or where a competitor in business is possessed of this most efficient adjunct to a complete laboratory outfit. From personal examination and test we can conscientiously recommend it to all assayers as a complete and durable appliance they cannot afford to do without.

The fifteenth annual outing of the Jeffrey Manufacturing Company of Columbus, Ohio, took place June 24, in the form of an excursion to Lake Hiawatha Park at Mt. Vernon.

The officers and employes of the company, accompanied by their families, assembled at the Union station at 7:45 a. m., and were carried to their destination in two special trains of 14 cars each, the first leaving at 7:55, and the second 20 minutes later. Both trains were crowded with the jolly picnickers, who numbered about 1500. The trains ran through without stop and made the trip in a little over an hour.

A very pleasant time was had. Sports of all kinds were participated in, and the Jeffrey Band furnished delightful music throughout the day.

Baja California Ilustrado is the name of a publication being issued by J. R. Southworth, at 23 First St., San Francisco, Calif. It is to be printed in English and Spanish, parallel columns, on heavy book paper, bound in cloth. This is the only publication descriptive of Lower California's resources, endorsed and authorized by the Mexican government. It will be issued about August 15th, and will



FIG. 3.

contain the most complete description of all the mineral bearing sections of the peninsula. Price \$2.50. Mr. Southworth has had extensive experience in literature in Mexico, and has visited nearly all parts in the peninsula in securing data for this valuable work.

CORRESPONDENCE

COLORADO.

(From Our Special Correspondent.)

DENVER, JULY 2, '99.

The severe slump of last week was only a temporary matter and illustrated more forcibly than anything that has occurred on our Colorado markets, for a number of years, the solid foundation on which our mining stocks are now resting.

When it became generally known that the leading smelters of the State would be closed down on account of the disagreement brought about by the enforcement of the eight-hour law, there was a temporary rush on the part of the more timid holders to realize, and a disposition to take full advantage of the situation by the heaviest bear operators, who succeeded in driving down a number of the stocks from 10 to 25 per cent; but the rallying reaction followed so quickly on the heels of the depression that it caused quite a stampede on the part of the "shorts" to recover.

As an illustration of the elasticity of the market, Eltkon, which was selling a week ago at 80 cents, is now back to 88½, a gain of over 10 per cent for the week. El Paso, which was selling at 18½ a week ago, recovered to 26½, a gain of nearly 40 per cent within the week. Isabella, which dropped to 68, went back up to 79½. Jack Pot, which was driven down to 29, went back to 35½. Matoa from 24 to 32½; Portland from \$1.65 to \$1.95½; Union Gold from 18¼ to 26¼; Pinnacle, which was driven from 15½ to 11½, rebounded to 17, and all of this before any definite agreement had been arranged for the re-starting of the smelters.

Notwithstanding the rapid recovery of the last three or four days, we still believe the present a good buyers' market and that there will be a decided advance all along the line during the next thirty days. It is still somewhat difficult to foretell what will be the outcome of the trouble between the smelter trust and its employees. One thing, however, is certain, and that is, no matter how serious or long continued may be the war between the two factions, it cannot detract one dollar from the intrinsic value of the mining properties, or their capacity for output in gold whenever the trouble is settled, and, in the meantime, in the Cripple Creek, Gilpin and Clear Creek districts, sufficient facilities for the reduction of ores are at hand so as to enable mines to continue operations.

MASSACHUSETTS.

(From Our Special Correspondent.)

Graf's New Process for Treating Ores.

BOSTON, July 5, '99.

EDITOR JOURNAL:—A new process for treating refractory ore has been perfected by Professor Anton Graf formerly government expert for the testing of steel-nickel armor plate. I take pleasure in presenting the readers of the JOURNAL with a brief description of this process, and hope to submit a more technical description in a future letter. Suffice it to say for the present that the device consists primarily of a retort in which intense heat is generated by means of electricity and explosive gases. Different gases are used for different ores.

The first experiment was made with a retort having a capacity of 25 pounds. Recently, in order to prove the commercial value

of the discovery, a plant was installed capable of handling 500 lbs. of ore.

The first runs were made in from 50 minutes to one and one-quarter hours, reducing copper-nickel ore, as it came from the mines, to pure copper and nickel metal, copper being deposited on one pole of the electric battery and the nickel on the other. The second run was made in about the same time, and with perfectly satisfactory results. A few days ago a large amount of copper gold ore was tested from the Gold Hill mines of North Carolina, owned by the Standard Oil people. This ore was assayed 22 per cent in copper, but the smelters are unable to save more than from 9 per cent to 10 per cent copper, the rest apparently escaping in fumes. Professor Graf's device saved over 20 per cent of the copper, at far less cost than smelting charges.

The retort is cylindrical in shape, about 3½ feet high by 2 feet in diameter, and is built of ordinary brick. The cost of such a cylinder is about \$20. A pipe is attached to the base of the cylinder, and a fan is connected with the pipe, in order to carry off the fumes, thus avoiding explosions. A five-horse power dynamo furnishes sufficient electricity to carry on roasts for 100 tons capacity for twenty-four hours.

Prof. Graf claims for his invention both a saving in time, in fuel, in running expenses, in cost of construction and a greater efficiency in values recovered. Experiments have been carried on with many kinds of refractory ore, and always with success. One lot of ore recently submitted was so rebellious in character as to defy every known method of treatment. Graf's process saved all the assay values, and did it so quickly as to astound the owners of the ore.

Having already received several letters of inquiry from owners of free milling properties, I would say that I do not think this process would be of material advantage in the treatment of the ordinary free milling ore, unless the ore contains enough arsenic, antimony or sulphur to make treatment on the plates troublesome. But for enormous quantities of refractory ores already known to exist in this and other countries, such a process will undoubtedly prove of great value.

Standard Oil and Sugar Trust capitalists are understood to control the invention, and a large amount of money will be expended in making demonstrations on a still larger scale before any orders are accepted for the installation of plants.

ROBERT S. BICKFORD,
Stock Broker, 60 State St.

UTAH.

(From Our Special Correspondent.)

SALT LAKE CITY, JULY 8, 1899.

EDITOR JOURNAL:—The indications now are that the mining stock investors, who were depending on the downward tendency of the market continuing till the first of September, will be compelled to get in much earlier, if they want to take advantage of the lowest prices. A strengthening all along the line has been noticeable the past week at generally higher prices.

Adjax was somewhat weak-kneed, owing to the many conflicting rumors as to the future policy of the management.

Alice was quiet with steady prices.

The outlook for Bullion-Beck continues very favorable and the stock continued upward.

Persistent rumors that the Bullion Beck Tunnel insiders have been paying recent assessments with accommodation checks, while

the outside people have been paying cash have caused that stock to go down.

Centennial-Eureka was sought and found not by the anxious buyer.

The promise of dividends in the near future failed to cause any change in Chloride Point. It will take something substantial to renew public faith in the management.

Daly went above \$1 55 and closed stronger.

The general favorable impression of Daly-West continues and the stock moves steadily upward.

The Dalton & Lark option has been continued.

Daisy has been making further gains this week, probably owing to a large buying order which is out, to the disgust of the insiders, who apparently were hoping for lower prices. The mine is looking better every day, and those who get in at present prices stand to get a nice profit on their investment.

Eagle & Blue Bell quietly held its own.

Four Aces fell off somewhat.

Geyser-Marion remains steady, although reports from the property should cause an advance.

Galena will probably see better prices in the near future.

Grand Central continues sending in the good stuff and is a buy at present prices.

Joe Bowers did some lively see sawing, but closed down.

La Reine continued strong around the dollar mark; some predicting a rapid advance, as management announces that shipments will commence before the end of the month.

Lower Mammoth only levied a 5 cent assessment, and the removal of the uncertainty had a good effect, the stock moving up a little.

Mammoth was weak and declining.

Mercur held its own in the trading. The dividend will be paid Monday.

May Day was quiet.

Manhattan was again visible to the naked eye. It is a cheap buy at present.

Although reports from Northern Lights continue flattering, the general public seems inclined to touch it very lightly, if at all.

Overland is seemingly doing nicely. The stock is apparently not on the market at any price.

Considerable Ontario came out the past week at steady prices.

People who got in on Petro at present prices should realize a nice profit in the near future.

The demand for Sunshine was strong up to 60 cents.

Swansea was somewhat more active at steady prices.

North Swansea was pointed upward and will bear some attention.

Sunbeam fell off from last week's prices, but recovered at the last a little.

Sacramento was unchanged.

Star consolidated sold down.

Valeo barely held its own.

Very respectfully,

P. J. CONWAY.

Miscellaneous Mining News.

ARIZONA.

Rosemont camp is forging to the front with every prospect of becoming one of the most prosperous copper camps in the territory. One hundred men are now employed in the mine and at the smelter copper bullion is being shipped weekly and development work is

the order of the day. The mines at Rosemont have a reserve of ore blocked out sufficient to keep the smelter running for two years, and that with each succeeding day large ore bodies are being uncovered and left in reserve for future use.

Fitzgerald, connected with the El Paso smelter, has a promising claim on which at a depth of 25 feet, he has uncovered a five-foot ledge of sulphuretted ore.

Although this district is but twenty-two miles from Tucson, little has been known of the promising section.—*Phoenix Herald*.

CALIFORNIA.

AMADOR COUNTY.

In the Spagnoli mine at Clinton a station was cut at the 100 foot level and sinking was resumed. The shaft is now down 120 feet. This is good work, as the shaft was commenced May 7th.

The Tellurium mine, near Pine Grove, was closed down on June 10th, and the employees of the property have not received the pay for the previous month's work, which was due on that date. They have been put off from day to day ever since.

Charles Fuller is sinking a shaft on the Volander property located near Middle Bar for the Cottrells, who are printing machinery manufacturers of the East. Mr. Fuller has left the Esperanza mine and is doing the work on the Volander on contract.

Superintendent S. K. Thornton of the Shenandoah Mining and Milling Company has the shaft down 125 feet. It is now in a body of white quartz which is nine feet thick and prospects well. This is the property formerly known as the George Easton mine.

Colonel Ranlett at the Newton mine is pushing the reopening of the property as rapidly as possible. The shaft has been reopened and repaired, and they are taking out ore. On the surface tracks are being laid and material is being put on the ground to facilitate the erection of the eighty-ton smelter, which is on the ground.—*Amador Ledger*.

CALAVERAS COUNTY.

John T. Davis, who is putting up a gold-mining dredger near Wallace, was in Stockton on the 28th, to look at machinery being made for him at the Stockton Iron Works. He reports that the two mines on which preliminary work has been in progress in Wallace were to start up and would be in full blast. A power amalgamator has been brought to the town and put into position. Mr. Davis says that in the gold-bearing gravel there, at a depth of 25 feet he has obtained as much as \$1.45 to the pan.

Active operations are being prosecuted at the Mead mine at Rich Gulch. A new Bryan roller mill is being erected upon the property, and other necessary improvements being made for working the mine to advantage. Levels are being run and the work of taking out ore has commenced.

EL DORADO COUNTY.

A mining company was organized in Placerville with local capital, to prospect the Tipton Hill mine on the North Side. It is a deep gravel proposition, to be worked by drifting. At Tipton Hill an ancient stream, several hundred feet in width at this point, has been cut off by a branch of Rock creek. Considerable work was done in that vicinity in early days in the shallow gravel deposits resulting from the wearing down of the lava-capped stream, but very little work has been

done in the ancient channel which extends for a long distance through the hill. C. W. Kimble is superintending the enterprise and Thomas Swansborough will be foreman. A party of men went over last week to commence driving a tunnel. About ten men will be employed when the work is entirely under way.

GLNN COUNTY.

The Red Hill mine people have run a pipe from the Amador Queen No. 1 ditch to the ditch near the Indian Camp beyond Scottsville to supply Blue Lakes water to the Red Hill mill at Butte City. They tested the pipe and the water came so forcibly that a wickup at the camp was wrecked.

INYO COUNTY.

Ernest Davot, who is mining in the Slate range, had a return of \$175 per ton from the ore milled at the Red Dog, near Randsburg. He has a number of good claims, but the ore is not free milling. He is at work piling up ore and does not expect to mill any more until a mill is erected near him. He is located only a little distance from Dean & Jones.

Deep Springs Mining District.

A communication to the *Inyo Register* says: "This district, in Inyo county, California, has been lying dormant for many long years, but is now making rapid strides to the front. In a comparatively short time it will rank among the richest mining districts in Inyo county, and unsurpassed by any mineral locality in the State of California. This mineral belt extends many miles in a southwesterly and northeasterly direction, containing mammoth lodes of high grade copper and silver ores. This section has been greatly neglected, as no developments of any account have been done to unearth and show up its great mineral wealth.

"The district is about six miles southerly from Oasis or N. T. Piper's ranch. There are a few progressive miners in this district, the number including N. T. Piper and Robt. Summerville. They are the owners of a large high-grade copper lode, containing black and red oxides and carbonates. The trend of this vein almost circumscribes a high mountain, dipping to the center of the cone. This claim contains 3,000 feet, and crops out nearly the whole distance located, showing high-grade ore. The formation is disintegrated gneiss and azoic granite, which is known to be a permanent formation.

"The same parties, Piper and Summerville, are owners of 6,000 feet on a rich contact silver vein between lime and granite, which can be traced about fifteen miles. The character of this ore is green and yellow chlorides, with black sulphides and embolite ore. They have now fully 500 tons of this beautiful ore on the dump, assaying all the way from 300 to 1000 ounces per ton, and from \$5 to \$25 per ton in gold. This is free-milling, with merely a trace of copper and lead.

The facilities of this series of copper and silver claims are the best in this district—any amount of water power within three and a half miles, wood in abundance near at hand, and good wagon roads to and from the mines. The ore can be delivered to the mill for less than \$1.50 per ton. With all these facilities at hand, I can safely say that it is one of the best mining properties in Inyo county, and would require but very little money to erect a permanent plant and could be shipping bullion inside of three months. When this great mineral belt becomes known to Ameri-

can and foreign syndicates a new era will dawn upon Inyo county and a great boom will follow.

KERN COUNTY.

The Butte mine shipped out \$3300 during the month of June. The mine has changed hands, the indebtedness having been arranged for and a Los Angeles company having taken hold who will put on 20 men and push work at once. H. J. Woollacott, Ralph Levy, Johnson of the Union Hardware and Metal Co., and a number of others in Los Angeles are interested in the company now, Underhill retaining the other principal interest. The consideration for the other half disposed of was something less than \$25,000. Tom Miners has had charge of the work for the past month and for the past few days has been cleaning up making ready for the new company.—*Randsburg Miner*.

Work on the Yellow Aster mines is progressing rapidly.

The Hercules crosscut is now connected with the west drift on the Trilby on the same level. This gives better ventilation besides giving two outlets instead of one for ore and enables both engines to be worked in the development of the mines. The length of the crosscut is about 700 feet from Hercules shaft and about 400 feet from the Trilby winze.

As soon as the drainage tunnel now under construction is completed the working force in the mine will be reduced, but the production of ore will amount to about the same.

SAN BERNARDINO COUNTY.

A suit involving many thousand dollars was begun July 6th in Department Four of the Superior Court, Los Angeles, Cal. There are two suits and both involve directors in the Ivanpah Smelting Company of San Bernardino county.

W. E. Robinson, a director of the company, prays that a receiver be appointed. This action is entitled W. E. Robinson vs. President J. D. Hanbury. R. H. Knight and Johnstone Jones are attorneys for the plaintiff.

The complaint recites that on August 11, 1898, Hanbury and Robinson formed a partnership for the purchase and acquisition of stock in the company, and that they acquired 1440 shares. These shares were entered in the name of Hanbury, Robinson trusting his partner to that extent.

The action further cites that on May 15 Hanbury took possession of the books as well as of the stock and refused to give his partner access to them.

The directors of the Ivanpah Smelting Co. state that the articles published in regard to the suit convey a wrong impression. The suit is simply the outcome of a personal misunderstanding between Robinson and Hanbury. The affairs of the company, it is said, are not in a tangled condition and are only indirectly involved in the trouble that has arisen between Robinson and Hanbury.

COLORADO.

The Grace Greenwood is the scene of one of the biggest strikes in the history of Gold Hill. Last week in the 185-foot level, a large ore body over six feet in width was encountered. Three feet of the ore will ship at about \$25 to the ton, two feet averages about three ounces and from a foot to 18 inches will go better than four ounces to the ton. The

mine is operated by the Jerseyville Mining and Leasing Co., an eastern concern. Quite recently a considerable amount of capital has been expended in the equipment of the mine, with machinery and necessary buildings.

The output from the Whipp and Glenn lease on the Lansing property of the Pinnacle company for the present week promises to be the heaviest since those miners first struck ore on the claim. At least four carloads of ore and probably five, will be sent out from the mine. The ore body in the second level has been drifted on for a distance of about 26 feet; a cross-vein equally as good as to its mineral-bearing quality is also being encountered in these workings. The ore-body in the breast of the drift now measures seven feet across and carries almost incredible values to one not acquainted with the richness of Pinnacle ore. The main working shaft is being sunk as rapidly as three shifts can break rock, and the lessees estimate that they will be hoisting ore through it, at the outside, in 18 days. The engine house has been completed and the finishing touches are being put on a fine two-story ore house. This double-decked ore house has room for 75 tons and will be tested to its fullest capacity.

The Mitchell workings, under lease to Melbourn and Geraghty, are showing up well and ore is being piled up in the bins for future shipments.—*Colorado Springs Mining Investor.*

IDAHO.

The Helena-Frisco Mining Company has made two heavy purchases, securing the Black Bear mine and mill, together with several adjacent claims, locally known as part of the Black Bear property, from the Morning Mining Company, and the Gem and Galena mines from the Milwaukee Mining Company. Little definite is known regarding these deals beyond the fact that they were made.

A force of 40 men, 25 underground and 15 outside, went to work on the Helena-Frisco.

Additions were made gradually, 60 men going to work last week, 14 of them being old machine men. The mill was run a short time, and it will not be long until the water of Canyon Creek will be muddy again.

The Gem and Galena, adjoining claims on the same vein, have always been worked together, being known as the Gem. It was one of the earliest Canyon Creek properties opened up, and for years was a steady dividend payer. By the summer of 1896, when lead was hanging around \$2.50, the Gem reached a point where it was necessary to put in heavier hoisting machinery in order to sink deeper or shut down. Under the conditions the latter was deemed the most advisable and the Gem was idle until a couple of months ago, when the work of pumping out the flooded works was commenced.

The Black Bear was also opened early, being controlled by the Seiberlings of Akron, Ohio. A mill was built and the upper levels of the mine opened. About \$85 00 worth of ore was taken out when operations ceased, it not proving profitable.

Nothing more was done with it until last fall, when it was sold to the Morning Mining Company. Work was immediately commenced on the lower tunnel, and a few months later the ore chute was struck. More than 1,000 tons of ore have since been shipped, all of which was taken out in doing development work.

MICHIGAN.

At the Isle Royale mine they are now just starting the work of actual development, and are employing a force of about 135 men in the mine and at mine work on the surface, and there are besides about 70 men engaged in construction work. The force of men will be added to as fast as room can be made for them.

Tri Mountain has temporarily abandoned the sand shaft, and is now sinking two pits further south to catch the extension of the lode upon which Copper Range recently found such rich copper. The latter is about a half mile distant from the location of the Tri Mountain pits. Tri Mountain already has found the extension of the first lode found on Copper Range lands, which is 400 feet west of the rich one. They have located their new shafts by measuring from the first lode and ought to soon find the rich Copper Range vein.—*Iron Ore.*

MONTANA.

Recent Mining Transfers.

Several mining deeds were placed on record July 3d, 1899 to mineral claims located in the Mineral mountain or copper mountain unorganized district. By one John K. Waite of Helena transferred an undivided one-half interest in the Porto Rico claim, and an undivided one-sixth interest in the Copper World, Le Roi, W. J. Bryan, Marlinspike and Big Matte claims to Marcus L. Hewitt of Basin for "\$1 and other valuable consideration." A second deed by John K. Waite transferred to A. E. Spriggs of Townsend an undivided one-sixth interest in the Copper World, Le Roi, Marlinspike, W. J. Bryan and Big Matte claims for "\$1,000 and other valuable consideration." A third deed transferred from John K. Waite and Marcus L. Hewitt to the Montana Mining Company a one-third interest in the W. J. Bryan, Copper World, Le Roi, Marlinspike and Big Matte claims and the whole of the Porto Rico claim for \$1.—*Anaconda Standard.*

NEVADA.

The 20 tons of Cat Creek ore sent by the Mexicans to Bob Stewart's mill at Hawthorne yielded \$30 per ton. Three men took this out in about two weeks, and there is said to be plenty more in sight.

The whim house and blacksmith shop at Waddell's mine, Hawthorne district, was destroyed by fire Saturday night June 10th. It is thought that a spark from the forge dropped into a sack of coal and that this caused the fire. The loss is about \$500.—*Walker Lake Bulletin.*

NEW MEXICO.

An \$8,000 shipment of ore was made from the Lookout mine, near Hillshoro, last week. At Robins & Hilty's Trujillo Creek mine the water has chased the miners away from the rich ore bodies and caused a suspension of operations until pumping machinery can be secured from Denver.

Four leasers in the rich north workings of the Opportunity mine averaged \$6.50 per day to the man last week.—*Hillsboro Advocate.*

OREGON.

The Virtue Consolidated Mines—the Virtue and Collateral—with scene of operations eight miles east of Baker City, are bonanzas that it might be said has attracted Spokane capital in lump sums to invest in the Baker City gold fields. At any rate, it was Capt. C. H. Thompson and O. G. Laberee, of Spokane who saw in the Virtue and Collateral a good thing and were not slow in getting hold of the properties. The good results that have followed brought other Spokane money to the scene until now the woods are full of Spokane hustlers after mines and in many instances with great success.

Since the Spokane men mentioned got control of the Virtue and Collateral mines the developments have been surprising. For months past a monthly gold product of \$20,000 has been sent to the bank in Baker City, and there is every assurance that the output will continue for a long time to come. Superintendent Burkhard sent a \$10,000 retort to the mint, a part of the month's production

SOUTH DAKOTA.

Black Hills Notes.

The Jackson brothers, who have a lease on a portion of the Dacy ground, are making regular shipments of ore which is a good grade. They have a body of ore of considerable size.

The diamond drill which is being used by the Kilpatrick brothers to sink to quartzite in the old Dacy shaft, has attained a depth of about 750 feet from the surface, or about 250 feet from the bottom of the shaft. The drill is making good headway, although working in a tough material. It is believed that quartzite is not far distant.

The building for the new cyanide plant, which is being put up by Allen, Small and associates, has been completed, and a part of the machinery has been put in place. The crushing machinery will be furnished by the Gates Iron Works of Chicago.

The Holy Terror properties, Keystone district, are again running, much to the satisfaction of the people of Keystone and the Black Hills in general. There was a difference between the price to be paid for timber offered by the company's agent and the government official which had to be adjusted before fuel could be obtained for the stamp mills, causing a shut down of several days.

UTAH.

With every shift's work T. D. Sullivan's Little Chief property on the east side of Eureka townsite and on the Ragle and Blue Bell and the Grand Central ledge, gives more certain evidence of wealth near by. Some time ago they passed through a body of black quartz of a copper-bearing character and at a depth of 185 feet splendid white quartz having the characteristics of gold rock. Those best informed believe that in a very short time they will get into the ore and open a bonanza. Jake Moritz and J. Oberdorfer visited the property this week and returned home in a very happy frame of mind.

The Chloride Point mill, Mercur district, is making an excellent record, and heavy returns are promised from now on. An average of 50 tons of ore is being treated daily and in

cleaning up two of the tanks recently they were found to yield some \$3,500. A \$30 ore body 12 feet thick is reported as being just opened up.

The Ajax mines of Mammoth district, are sending in regular shipments of high-grade ore.

Excellent reports are coming in as regards to the Grand Central properties, near Mammoth.

The Mammoth, of Mammoth, is shipping all the high-grade ore, only the low-grade rock being sent to the mill, and the superintendent may ultimately suspend mill operations at least in part.

The Daly-West Company of Park City has sued the Anchor Co. for \$20,000 for ore unlawfully extracted. Ore shipments still continue to be heavy.

A night shift has been put on at the Ontario mine, near Park City, and operations are considerably increased.

Ore is coming in regularly from Valeo mine, Park City district.

Development work is progressing steadily at the Eagle and Blue Bell, Eureka district, and the ore showing continues good.

Northern Lights mill, near Mercur, is making a good showing, and high-grade ore is being sacked daily.

The Petro mine, Bingham district, is making regular shipments of high-grade ore.

The Utah mine, in Fish Springs district, is sending in some very high grade ore.

WASHINGTON.

At the Crystal Butte mine on Meyers creek, three miles south of the International boundary line, machinery for crushing and concentrating ore is being installed, and a force of men is building a wagon road from the mine to the mill and a flume for the conveyance of water.

At a depth of 12 feet on the Utica, a Douglas mountain property, a 5 foot vein, all in ore, has been struck, assaying \$21 in gold. The shaft will be continued on the vein 100 feet, and if the quantity and value hold it will make a star on old Douglas. It is by far the best thing struck in the camp during the past 60 days.

A 300-foot tunnel has been started on the Orient, on Toulon mountain. Work will be pushed by day and night shifts. This is a high-grade copper and gold proposition and considerable shipping ore, which has been extracted from the shaft, is on the dump and in bins.—*Miner and Electrician*.

JULY 8, 1899.

A better tone characterized the market this week, although with but few exceptions the speculative stocks dropped still further.

The investment securities are in big demand. The chief interest centers around Deer Trail No. 2, some 30,000 shares changing hands. The control of this company has recently passed into the hands of Eastern Canadians at a good round figure, and the increase in dividends is now anticipated at an early date.

Jim Blaine has declined further and is now offered at 28c. Inasmuch as this property adjoins the Republic, and the vein of the Republic has been developed in this property,

it is selling much below its intrinsic value, and we consider it today the best buy in the speculative stocks.

Mountain Lion is being heavily dealt in by Eastern capitalists around \$1.27. It is estimated that this company has over \$3,000,000 of ore in sight.

Morning Glory is again drawing attention. This is the best gambling stock on the market, and from reports is bound to make a very rich mine.

The control of the Trade Dollar is said to have been purchased by the Clark interests, and in consequence, the stock advanced 4c. per share.

Princess Maud has declined to 3¼, and then gained 2c., closing at 5¼. In our opinion, speculators cannot afford to overlook this stock. We have repeatedly advised our clients to buy this stock while it was low, and no other, 10,000 shares will make a handsome profit on your money.

Winnipeg in the Boundary District is showing up wonderfully well, and the stock is in fair demand at 33c. Yours truly,

BRITISH CANADIAN INVESTMENT
AND MINING SYNDICATE.

FOREIGN MINING NEWS

BRITISH COLUMBIA.

R. S. Gallop has five men doing development work in the Phoenix group, on Horse Thief creek, East Kootenay district, which is looking good. A break has been found in the mountain, which exposes a vein of ore from 4 to 18 inches wide, of high-grade ore, running 60 feet deep from the surface, on the World's Fair, a claim adjoining the Phoenix, and the vein has been traced clear across the World's Fair and Phoenix, showing the same vein and grade of ore all the way. Open cuts have been run in several places, and two tunnels started to tap the vein at about 150 feet. It is expected the property will be worked all next winter. The owners have nine claims and all nearly join and on Toby and Horse Thief creek and will push work on all.

The Ymir mine is now shipping crude ore to the Nelson smelter, as the stamp mill cannot treat it.

The Porto Rico shipped 40 tons of concentrates to the Le Roi smelter at Northport last week.

The Baltimore and Le Roi claims have been bonded for 60 days by G. N. Dawson. Six men have been put to work on the claims.—*The Kootenayan*.

The Boston and British Columbia Copper Mining and Smelting Co. of Boston, Mass., has taken a bond for \$65,000 on the Standard group, near Revelstoke.

Fox & Ross, of Toronto, for the Sailor Consolidated Co., have made a deal for the Roon and Alice Fraction, between the Sailor and Cariboo properties in Camp McKinley. The consideration was \$10,000.

Hon. Chas. H. McIntosh, late manager of the British America Corporation, is said to have formed a new company with Lord Aberdeen at the head, and \$20,000,000 capital, for carrying on Mining operations in the Pacific Northwest.

Hon. A. W. Morris, of Montreal, and Chas. G. Griffith, of Spokane, have secured the well known Fidelity property, adjoining the famous Bosun, near New Denver. The Bosun,

now being worked to within a few feet of the Fidelity, has shipped since last September 920 tons, netting from \$60 to \$75 per ton. Messrs. Morris & Griffith have also purchased the Ashland, in Southern Oregon

MEXICO.

Mr. J. Vorba, the Mexican land expert, reports a great activity in the development of the mining region south, southwest and southeast of Oaxaca, state of Oaxaca, some prospects showing 203 ounces of silver per ton, and others assaying \$1,400 worth of gold ore.

The Panuco Copper Company has recently been organized in London, with a capital of £500,000. The property of the company lies midway between Monclova, on the Mexican International and Salome Botello, on the Mexican National, in the State of Coahuila. It embraces an area of 138 acres. The mine has already been extensively opened by tunnels.

A rich lode of ore has recently been met with in the old part of the Santa Ana mine, in Pachuca District, State of Hidalgo.

A serious cave in is reported in the Santo Domingo mine, Santa Eulalia District. The large ore bodies in the Santo Domingo are very dangerous to work at all times.

GENERAL NEWS

SAMPLING PLACER DEPOSITS.*

BY EDMUND R. KIRBY.

Every engineer who has to do with placer work realizes how difficult it is to ascertain, even approximately, the average gold contents of gravel.

The problem presented often comprises gravel beds measured by acres, or by miles of gulch bottom. The quantities which it is possible to use for actual tests, whether measured by panfuls or by thousands of cubic yards, are but a minute fraction of the great bulk. Moreover, the distribution of gold in this mass is irregular and uncertain to an extreme. From the nature of the deposit, only small portions of it, at best, can be rich enough to pay. These local enrichments are due to the concentrating action of the stream at intervals during its long history. They are, therefore, subject to all the irregularities which might be expected from its ceaseless shifting and the changes in the material deposited.

Notwithstanding these difficulties, a business decision is called for, and it is always necessary to reach a sound conclusion without expending more time and money than the circumstances warrant. In most cases, therefore, it is best, if possible, to carry on the work by successive steps. If the general evidence examined proves satisfactory, it affords a basis for proceeding to the simple and inexpensive tests. Encouragement from these will warrant more costly test workings, and the latter may be followed by the heavy and decisive test work which is to settle the question at issue.

The Structure of Gravel Deposits.—In most cases presented throughout the West, the gold-bearing gravels are deposits from the present system of streams, and their form and

*A paper read before the Colorado Scientific Society April 1, 1899.

position have probably been developed during the Quaternary period. The high gravels of the California ancient river system are of earlier date, and form a class by themselves. As compared with the more recent deposits, they are limited in quantity and differ radically in structure, character of the gravel, grades, and methods of working.

Only the first-mentioned deposits are under consideration here. They may be conveniently classed as "high bars" (above water level) and "bottom gravel" (at and below water level). The high bars are remnants of beds which were deposited before the stream cut down its gulch or valley to the present depth. They were originally terraced, but have frequently been shifted or changed in external shape by erosion. They were the most accessible and easily worked deposits, and, generally speaking, are now very scarce.

The deep gravel filling the present gulch or valley bottoms below water level, constitutes the principal bulk of the deposits now remaining in every placer district. As a rule, it is inaccessible without the aid of skilled engineering, modern appliances, and the use of considerable capital. Of late years, these deep deposits have attracted much attention. This is on account of their abundance and because of the possibilities which may follow their development. The uncertainties and difficulties of such work are very great. It has been best developed by "river mining" in California, and in various districts of the Northwest. During the last few years modern heavy machinery for excavating, hoisting and conveying, has been brought into use for this work. Many mistakes have been made in its application, and most attempts of this kind, have, so far, been financial failures. Steady progress is being made in perfecting such apparatus, and there is, without question, a large field for its application to cases where the conditions are suitable.

It is clear that the climatic and other conditions under which a stream cut down its channel in the bedrock were different from those which prevailed while gravel beds were deposited in this channel. In the first case, there was a large volume of water and probably steep grades. In the second case both waterflow and grade must be less, and this is the condition which now prevails in our western rivers and streams. The present grades are generally less than two per cent, and the transporting action on large gravel, even in the time of freshet, has almost ceased. The bedrock is now protected from erosion by a more or less heavy bed of gravel, over the surface of which the stream flows. In many cases the processes of erosion and deposition have alternated frequently, and this accords with what is known of climatic changes during the Quaternary period.

The gravel beds are made up of various streaks or layers, some of which may be gold-bearing while others are entirely barren. These layers have all the irregularities of stream-deposited gravel. They are sometimes quite uniform in thickness and value over considerable areas, as though spread out by floods. In other cases they form crescent-like overlapping streaks, varying greatly in gold contents and indicating their deposition in side bars by the stream as it shifted its position. During the deposition of gold-bearing gravel, the light or scale gold is apt to be distributed very uniformly throughout the entire mass. The heavy gold on the other hand, tends to concentrate out in special streaks or layers. It is a frequent occurrence to find rich layers on top of barren layers, and many

facts indicate that during the deposition of rich gravel, its gold contents do not work down through undisturbed gravel beneath. When pay gravel exists in the gulch, it is generally confined to a ribbon-like layer on or near the bedrock. It is not likely that this is the accumulation of gold which has sifted down from the overlying mass. On the contrary, there is every reason to believe that the bedrock channel for a long period acted like a sluice. As the transporting power of the stream gradually lessened, its gravel was alternately moved, and then redeposited. This sluice action, with the repeated shifting and loosening of the first deposits, doubtless caused their gold to accumulate in the bottom layers.

This pay lead, or bedrock channel, is usually of limited width and meanders along the gulch, marking in general the course and width of the stream at the time. There may be two or more of these channels, and they are not necessarily in the deepest part of the gulch. They may be found higher up, along its sides, as portions of earlier channels, made before the bedrock of the gulch was cut down to its present depth. In such a channel, the distribution of gold is very irregular, but on the whole, it seems to follow the rule so often observed, and is heaviest on the inner sides of bends. It is usually necessary to work the channel by a pit or open cut. It is a rare occurrence to find that the general mass of gravel filling the gulch will average enough for pay. The slope required for the sides of the excavation increases the proportion of this poor gravel, so that the pay lead must be rich enough to bring up the average to the pay point.

Evidence Available in Placer Examinations.—A determination of the average value of gravel is only one of the numerous questions, both business and technical, which arise in a placer examination. It is often unnecessary, because the business decision to be made may be settled by other considerations. Moreover, the books and records of an established placer enterprise will often supply the data necessary to estimate the value of the ground worked. The reliance to be placed upon such evidence is matter for special judgment in each case. Generally, actual tests must be made, and the evidence to be secured may be roughly outlined, as follows:

I. General evidence derived from the history, records, facts shown by prior workings and neighboring mines, structure of the deposit, etc.

II. Evidence from sampling gravel already exposed. Such exposures may be found in surface gravel, natural banks, and gullies or prior workings.

III. Evidence from special test workings made for the purpose. These may include shafts, down to water level, and such work may be made light or heavy as warranted by the circumstances, and the facts developed during its progress.

IV. Evidence from heavy and decisive test workings. In high bars this may merely include a more extensive system of test shafts and drifts in the dry gravel, but in the water-bearing bottom gravel such work is very difficult and expensive. This should not be a serious objection, in view of the heavy investment which will be necessary to open and work a deposit of this character. The very existence of a pay channel, to say nothing of its grade, is uncertain. To risk a large investment on mere chance, without first feeling the way by such preliminary

work, is not a course which will appeal to sound business judgment.

On account of the expense of testing gravel, it is impossible to cover a large territory. In practice, all that can be done usually is to select the most promising and workable locality, and decide the question at issue, by the value of this portion. The test workings should be so arranged as to define the shape and limits of the pay ground. In a large area or a thick mass, there is no better system than a number of shafts.

A channel may be exposed by a cross-cut drift from a shaft, and a few cross-sections of this kind at different points should give a fair idea of what may be expected from it. Bottom gravel may be 500 to 1,500 feet wide, and the main difficulty at first is to locate the position of the bedrock channel. It will generally be best to secure some evidence on this point before starting a shaft. There is no better way of obtaining this than by a number of drop-drill holes, which will give an approximate cross profile of the bedrock and will also give some evidence as to the presence of gold and the character of the gravel.

The units for measurement used for placer gravel vary according to the shape of the workable ground. In a thick mass it is the cubic yard. In a thin sheet, with the values on the bedrock. It is customary to use a unit area, such as the claim or the acre. For a channel, a unit of length is preferred, giving the yield per 100 or 1,000 feet of length. The extreme irregularities of the deposit are always to be kept in mind, and figures of measurement, like those of value, are to be used with caution. In averaging the result of tests, each should be given a value proportioned to the volume of gravel which it is supposed to represent.

(To be Continued.)

THE FUTURE OF THE STAMP MILL.

T. A. Rickard, in speaking of this important question in his noted work *The Stamp Milling of Gold Ores*, has the following to say which is concise and absolutely correct:

"The stamp-mill has suffered much in repute from the frequent failure to adapt the design of the mill to the capacity of the mine or the character of the ore. Some men order a reduction plant like others order a dinner. They go to the representative of a well-known machinery firm and tell him about the mine and the nature of the ore, and then leave the choice of the arrangement of the mill to him, just as a man might enter a first-class restaurant and tell the head waiter to serve a good dinner, leaving the menu to his judgment.

"Mine owners often hate to expend a thousand dollars in advice or experiment previous to the erection of an ore-reduction establishment, but really enjoy ordering a hundred-thousand-dollar mill, which may no sooner be completed and at work before they find that the process is unsuitable, or the ore-supply inadequate, hence the frequent monuments to folly which dot our western hillsides. *Hinc illæ lacrimæ* where shareholders inveigh against processes which prove a delusion and mills that fail to yield dividends, the causes underlying the miscarriage of the milling plants are not obscure. If they are hidden from the unwise and imprudent they are daily revealed to mere babes in metallurgical experience.

"Only recently a typical instance came across my way. A mine owner who is ordinarily a real estate broker went to the manager of a machinery-manufacturing concern

and exhibiting a piece of ore, told him he wanted a mill to treat material of which that is a sample. The ore carried a large percentage of pyrites, but the gold associated with it, so said the real estate broker, was entirely amalgamable. The machinery man advised him to put up a long-drop, slow-speed stamp-mill, supplemented by concentrating tables. It was so ordered. The mill was shipped in due time and was erected in the wilds of Idaho. From the very start everything went wrong. The mill did bad work and the mine owner anathematized the machinery man, and the latter excommunicated the former. Not long afterwards I happened to be on the ground and found the facts to be simple. When the mill was ready to start it was fed, not with the hard pyritic quartz, such as the original sample shown, but with very soft surface gossan.

"The feeding was low. The stamps with their long, slow drop came crushing through the thin cover of soft material. Cams began to break, shoes went into splinters and screens were destroyed in a day. The mill was overhauled, the drop was shortened, and the cams replaced by others. The arrangement of the mill was gradually so modified that it became a hybrid between a short drop, quick-speed form of battery and its original design. Better results were obtained. Then a new superintendent came upon the scene. Work on the mine was transferred from the surface open cuts to deeper levels. Hard pyritic ore was sent to the mill. The crushing capacity of the stamps was diminished, and the amalgamating tables, their slopes remaining unchanged, were unable to clear themselves. Extraction declined out of sight. The machinery firm was again pilloried. About this time the undertaking got into financial trouble and the plant was hired by a neighboring company, which was able to treat its (similar) surface ore with marked success. It all sounds foolish enough, but pity 'tis 'tis true, and not once only, many times.

"The machinery man, however, often deserves censure also. There are establishments which have what they call a "standard" type of mill which they highly recommend for the reduction of ore running through a whole gamut of differing compositions. Like the iron bed of Procrustes, to which the wayfarer had to suit his length at the risk of summary abbreviation or painful elongation, so the manufacturer expects the ore to choose between being labeled refractory or unprofitable. These are difficulties which could be readily overcome. The failure of a plant hurts the reputation of the firm that supplied it no less than it decreases the value of the mine. It would be a profitable thing for both parties in the transaction if, it being agreed that the order will be placed, they could agree upon an investigation of the ore by a competent authority with a view of determining the best treatment, the expense of such investigation to be divided between them.

"More than once, in the course of investigations upon which these studies of milling have been based, there has come the question, Is the stamp mill likely to survive amid the inventions daily heralded from the Patent Office? Will it continue to compete successfully with the multitudinous pulverizers and amalgamators, together with the unending array of new processes which the restless brain of man brings forth from day to day? To the writer, looking over the field of metallurgical competition, and cognizant of the

fearful slaughter that befalls the army of ill-conceived and half-completed machines which their inventors fondly imagine competent to revolutionize ore reduction, there comes a strong belief that the stamp mill is destined to survive amid much competition, and to enjoy a career of further long-continued usefulness. Often enough some other process, or some different pulverizing mechanism, is claimed to do better work than the stamp mill. Occasionally this is true for particular ores under particular conditions, but just as frequently it is due to the fact that in making the test the stamp mill has been of unsuitable design, or has been unintelligently handled, so that the comparison has been unfairly made. There is, believe me, just as much difference between a model stamp mill properly directed and an imperfect one badly managed as there is between the latter and some one or other of the newer processes of ore reduction.

"I have known a leaching process put in rivalry with an imperfectly equipped or improperly managed stamp mill, and the former has given a percentage of extraction greater than the latter, but, in the sequel, it has become evident that the stamp mill, when it has been subsequently provided with the needed appliances, and superintended by the necessary man, has surpassed the leaching process as much as the last previously surpassed the stamp mill.

"One feature of the stamp mill stands out clearly, when instituting a comparison between it and other pulverizers, namely, it is a crushing and an amalgamating, a reducing and an extracting machine combined. This distinctive feature has enabled it to hold its own against other newer inventions for pulverizing ores, and to meet the fierce competition of so many more complete and more complicated amalgamating machines. In the two extreme types of the stamp mill, so often referred to, we have seen, on the one hand,* how an increased degree of amalgamation has been secured at a sacrifice to rapidity of pulverization, and, on the other hand,† how fast-crushing has been aimed at, and battery amalgamation made subservient to the desire for the expeditious treatment of large quantities of low grade mill stuff. In the one case the mortar has been enabled to do work otherwise beyond its scope; in the other, ore has been handled with commercial success which otherwise could not be profitably reduced. It is interesting to note, however, that even in California and South Dakota, where the stamp mill is so destined as to be a rapid pulverizer, the amount of gold arrested inside the mortar forms about one-half the total extraction.

This feature of the stamp mill is one overlooked by many who daily direct their inventive genius to the discovery of a mechanism which shall surpass the clumsy contrivance whose reverberations echo from Coolgardie to Colorado. The steam stamp, for instance, eminently successful as it has shown itself in the quick reduction of the copper ore of the Lake Superior region, has not proved satisfactory in its application to gold ores. Why? Its crushing capacity, per horse-power consumed is much ahead of the ordinary stamps. True, but it does not permit of amalgamation going hand in hand with pulverization, the force and rapidity of the discharge are unfavorable to fine crushing, the extreme violence of the agitation inside the mortar prevents the introduction of amal-

gamating plates, and, as a whole, it notably fails in giving the conditions required for successful milling.

"The same question crops up in the discussion of the use of heavy stamps. The Alaska Treadwell Company made numerous experiments, and found 1000 pounds the practical limit. Heavier stamps might crush faster, and indeed did so, but this very fact resulted in the rushing of the ore through the batteries so rapidly that opportunities for that contact between the gold and the mercury which is the essential requirement for amalgamation were lessened to such an extent as to seriously diminish the percentage of extraction. The mill became a good pulverizer but a bad amalgamator.

"Nine-tenths of the patent pulverizers and new amalgamators thrust before the public through the medium of bombastic advertisements, are crippled by a similar defect. Where rapid pulverization is secured an ineffectual effort is often made to secure concomitant amalgamation, but in most cases the cutting up of the mercury introduced into the machine causes so much 'flouring' as to render a heavy loss of both mercury and gold unavoidable. I have before me, as I write, a typical description of a machine of this kind. The author of the description, who possesses merely a bowing acquaintance with his subject, emphasizes the statement that it is an 'evolutionary machine' which for the first time utilizes a new principle, namely, the 'atomic pulverization' of the quartz and the complete liberation of the gold. I happen to know that that 'evolutionary machine' lies resting in many a mill, where it can now be purchased on the basis of scrap iron. Let me mention another example: Late, while going up one of our picturesque Colorado canons, I visited a plant which has been rearranged. The man in charge informed me, with unnecessary emphasis, that mercury was a 'robber' of gold, and that his (the speaker's) 'new system,' which was to utilize 'hot water and air,' would plainly demonstrate such to be the fact. I enjoyed the subsequent conversation. That man was as deliciously ignorant of what the stamp mill can do and how it does it as the dog that bays at the moon is of astronomy. He had persuaded a few stock-brokers to introduce his 'new system,' of which what was useful was as old as the hills, and what was essentially absurd and impracticable was his, entirely his. Such instances are not uncommon. They happen weekly, in spite of frequent doses of bitter experience. They explain why so many mills are rotting in the sun and rusting in the rain—object lessons whose teaching is as unheeded as the whistling of the wind through the neighboring pines.

"Not that one would suggest that mechanical ingenuity and metallurgical experience will fail to better our present methods. No; but that betterment will be brought about by men who are cognizant of what is being done already, and of how the present practice was evolved rather than by those who are contemptuous of a process whose principles and application they have scarcely tried to comprehend.

"Therefore, in conclusion, to millmen and metallurgists, fellow-students in a field of endless interest, I would say: Let us endeavor to use the stamp mill intelligently, to understand the why and wherefore of every one of its successive operations, and to lose no opportunity of applying any contrivance or modification which experience sanctions and experiment corroborates. That done, we

*In Gilpin County, Colorado.

†In South Dakota and California.

shall have done our little as best we can. In the meantime, the inventive genius of this great mechanical age ruminates apart in an earnest effort destined in due time to evolve something better wherewith to catch the yellow gold whose want is the pain of some, whose excess is the curse of others."

Canadian Institute of Mining Engineers.

The Canadian Institute of Mining Engineers is to hold a meeting in British Columbia during September, in which the members of the American Institute of Mining Engineers were invited to take part. It will be possible for any such who desire to see under favorable conditions the mining districts of British Columbia to take part in that meeting, and subsequently reach San Francisco in time for the Institute meeting. According to the provisional program, the Canadian party from the East will leave Montreal September 1, or Toronto September 2, by the Canadian Pacific, proceeding by way of Owen Sound, the Great Lakes, Fort William and Revelstoke, where it will arrive September 8, after spending September 7th at the Banff Hot Springs. From Revelstoke the party will go to Nelson, where three days will be spent, and to Rossland (September 12) where it will stay two days. On September 15 the smelting works at Trail will be visited, and the party will proceed to Sandon, and via Slocan Lake and Slocan City to Nelson, which it will leave on September 19 on its return trip via Kootenay Landing and the Crow's Nest Pass, spending one day at the mines of the Crow's Nest Pass Coal Company, and arriving at Fernie September 20. For further information inquiry should be made of Mr. B. T. A. Bell, secretary, Ottawa, Canada. The trip above described will amply repay in scenic and professional interest those who can afford time for it as a preliminary to the San Francisco meeting of the Institute.

ELECTRICITY IN COAL MINING.*

BY JOHN FRICK JACKSON AND FRANK F. THOMPSON.

The statements in this short paper on the use of electricity in mines refer especially to the mining in soft coal. Of the essential elements in operating such mines, two of the most important are: first, apparatus to obtain efficiently the rapid handling of the coal; and second, to do this with the least possible number of openings. These conditions have evidently been large factors in causing the application of electricity to such operations.

The application of power to mines, which we wish to consider, are principally for (a) lighting, (b) haulage, (c) cutting or drilling, (d) pumping and driving fans.

Systems.—The systems worth considering, which are in use at the present time, may be tabulated as follows:

- 1.—Rope haulage and steam for all other purposes.
- 2.—Electric haulage and compressed air for other purposes.
- 3.—Electric haulage and electricity for other purposes.

Various other combinations are of course used, but these three will serve the purpose as representing well-defined types.

Rope Haulage and Steam Power.—In the past this system has been the standard, and even yet in many portions of the hard coal fields has a very firm hold. Experience has shown rope haulage much inferior to electricity in point of working economy, as is now

being illustrated by the continual substitution of electric for rope haulage now going on in the soft coal field.

The Mitchell Coal and Coke Company had two mines running at Gallitzin, Pa., under exactly similar circumstances, but one using rope, the other electric haulage. It was proven that the electric was far preferable.

Steam power for pumps and fans in the mines has likewise been shown by experience to have many faults. Timbers along which the pipes pass rapidly deteriorate. The piping is expensive to install, and can only be kept in good condition by constant attention. If the lines are long they are a source of large loss of power by radiation and condensation, even when well covered. They are a nuisance in the mines because of their high temperature. The steam motors are expensive, from the standpoints of repairs and attention. Steam cutting and drilling will in most cases prove unwieldy. Mines operated under this system are without suitable means of lighting, an important matter in rapid operations.

Electric Haulage and Compressed Air Power.—The Berwind-White Company's mines at Windsor, Pa., furnish an excellent example of this system, and so far as known, it has given complete satisfaction. This plant, which has now six mines in operation, with an output capacity of 5,000 tons per day, is eventually to be increased to ten mines with 10,000 tons capacity. The haulage in the mines is done by electricity, while the drills, interior pumps and fans are driven by compressed air. The use of compressed air has many obvious advantages. It is found that the machinery, working under the extremely severe conditions to be found in a mine, performs its duty well. It requires little attention and is thoroughly reliable. On the other hand, pipe lines in extended mines are expensive to lay and keep in repair. The pipes soon deteriorate, and when the lines are removed from old workings it is usually found that much if not all the pipe is in too bad shape for further use.

The flexibility of the system, or its adaptability to quick changes is not satisfactory.

Electric Haulage and Power.—For convenience in discussion this head may be divided into two sub-systems as follows:

- (a) Direct currents for haulage and other power.
- (b) Direct current for haulage and polyphase currents for other power.

The use of direct-current machinery for pumping and fans has not been found satisfactory in many instances. One large company after a thorough trial of such apparatus rejected it in favor of compressed air. The pumps in a mine are subject to only rare inspection and that, oftentimes, by unskilled workmen. These conditions combined with the unfavorable location of machinery will soon cause electrical troubles in the commutator, or elsewhere, of the most carefully constructed motor. Inasmuch as the stopping of a pump, even for a short time, may cause excessive damage, the use of such a motor is a constant menace.

The second electric system, that using direct and polyphase currents, has the inherent disadvantage of requiring the installation of two direct and separate sets of generators and wiring. That is a matter of serious importance, as will be indicated later, but is neither so expensive nor cumbersome as the piping used for compressed air. The great advantage in the use of polyphase currents lies in the fact that they permit the use of a motor that is perfectly reliable under essen-

tially all conditions of operation to be met with in mining. This compound electric system seems without doubt to be the best that can be installed for large operations. It comprises the advantages of all the other systems while eliminating their most serious defects. A system using polyphase currents alone might possibly prove more advantageous, but would have the serious defect of requiring two trolley wires, and even if this difficulty were overcome it would have to await the development of a polyphase motor suitable for a mining locomotive.

(To be Continued.)

PERSONAL NEWS ITEMS

ALFRED W. GRIFF, who is credited with having built the first smelting plant in Colorado, was in Denver recently.

GEO. W. HEINTZ succeeds F. A. WADSWORTH as general passenger agent of the Rio Grande Western Ry. ROY D. HUNTER, western agent for the Sullivan Machinery company of Chicago, was in Salt Lake City, Utah, circulating among the mining men. The company has recently filled an order for an air compressor at the Old Jordan & Galena, at Bingham, and the Sullivan drill is now being utilized in the development of this magnificent property, which is included in the consolidated properties owned by the United States Mining company.

WM. GIBBLINGS, general manager of the New York & Honduras Rosario Mining company, has recently left New York for Honduras.

F. H. NEWELL of the United States Geological Survey was in Arizona examining the possibilities for water storage at Phoenix. He is now in Los Angeles, Cal.

WALTER BLOOM has recently returned to Spokane, Wash., from an extended trip through Priest Lake Mining District in Northern Idaho. He reports the mining prospects as looking nicely, and the country around the lake fast filling up with settlers.

ALBERT SAHLBERG, managing director of the Esperanza Mining Company of El Oro, Mex., has recently gone to Chicago, Ill., to arrange for the purchase of machinery for the new 80-stamp mill and 150-ton cyanide plant being erected at El Oro.

JOHN FILLIS of Boston, Mass., is in Redding, Cal., in the employ of the California Consolidated Mining Co.

ALBERT J. ASSOCIATED MINING CO. has returned to Spokane, Wash. He is one of the owners of the Oro Grande, near the Jim Hill property at Republic camp.

SAMUEL NEWHOUSE has recently left Salt Lake City, Utah, for the East. He expects to take a trip through Europe before his return.

FRED H. HARVEY of Salt, Cal., has taken charge of the Jupiter Consolidated Mining Co. at Iowa Hill, Cal.

W. A. Raymond, who has charge of the work on the Kate Fry lode, near Leonia, Idaho, spent a few days recently in Spokane, Wash. He reports the properties as doing nicely.

WM. S. THYNG, a graduate of the Columbia School of Mines, has been appointed assistant professor of Mining in the Washington School of Science, at Pullman, Wash.

W. F. STUART has been appointed general manager of the Mountain mine in Sierra county, Cal.

A. C. MCKINSTRY of Fort Steele, B. C., has recently left for Moore, Canada. He is interested extensively in mining property around Fort Steele.

DR. F. W. HINE of Chicago, Ill., has gone to Round Knob, North Carolina, to put up a plant for treating and refining graphite.

J. P. HARVEY, who has been manager of the Republic mine from its start, has resigned, being succeeded by R. G. E. LUCKER of Montreal, Canada.

FRANK LEONARD, a prominent mining man of Northwestern Montana, is in Butte for a few days on pleasure.

W. H. WILBY of Idaho Springs, Colo., is reporting on some copper properties in Montana for one of the copper syndicates.

FORREST FARNUM of Grass Valley, Cal., has been engaged as foreman for the Poor Hills mine in Plumas county, Cal.

The LUNDSTROM Bros. and JOHNSON of Clancy, Mont., shipped 37 sacks of ore from the Elephant to the East Helena smelter.

W. H. BURNVOOR spent several days last week in Utah inspecting his mining interests.

A. E. HARRERT of Tacoma, Wash., recently left for a trip through the northern mining camps.

JOSEPH DICKER M. E., has recently arrived in San Francisco from Johannesburg, South Africa.

THOMAS TRAIL has been appointed head assayer at the new smelter at Twin Bridges, Mont.

* Paper presented at the 16th General Meeting of the American Institute of Electrical Engineers, Boston, June 27, 1909.

The Mining And Metallurgical Journal

THE MARKETS.

All quotations, financial reports and other statistical figures given under this head are New York Quotations, unless otherwise stated in each item. These figures are carefully revised each issue, and constitute a very accurate compilation of statistical matter.

New York, July 14th, 1899.

The following are the Silver, Copper and Lead quotations for the last two weeks:

	SILVER.	COPPER.	LEAD
July 1	60 1/2	18 23	4 25
" 8	60 1/2	18 03	4 30
" 15	60 1/2	18 00	4 60
" 22	60 1/2	18 00	4 60
" 29	60 1/2	18 00	4 60
" 5	60 1/2	18 00	4 31
" 12	60 1/2	18 00	4 25
" 19	60 1/2	18 00	4 25
" 26	60 1/2	18 03	4 25

SILVER

The silver market has ruled dull, but the reports of the shutting down of the Colorado smelter, on account of the labor strikes, silver closes higher and stronger, and the possibility of lessened supplies may affect the London market.

COPPER.

The copper market continues quiet. The buyers are covered and not inclined to purchase, while no pressure to sell is observable. Lake copper is offered at 18c., but a few transactions are reported at 17 1/2. Very little is doing in electrolytic copper, the quotation is still 16 1/2c. for cakes, wirebars or ingots, and 16 1/2c. for cathodes, while casting copper is nominal at 16 1/2c. and 16 1/2c.

LEAD.

There is an accumulation of lead in New York City, and free offerings at 4.42 1/2 @ 4.45c. The London market is unchanged, Spanish lead being quoted at £14 3s. 9d. @ £14 5s and English at £14 8s. 9d.

SPLTER.

Under free offerings, prices declined further. Spelter is quoted at 6c. New York, and 5 80c. St. Louis, ordinaries in London being quoted at £27, with specials £27 5s.

ANTIMONY.

Antimony continues in good demand, with prices unchanged at 10 1/2c. for Cookson's; 10c. for Hallett's, "C" U. S. Star and Hungarian.

NICKEL.

Nickel continues unchanged and no alternation of prices can be reported. We quote for ton lots 33 1/2 @ 36c. per lb., and for smaller orders 37 1/2 @ 38c. London prices are 14 @ 16d. per lb., according to size of order.

TIN.

The market has moved but sluggishly, and prices have changed little. The London market is quoted in closing at £116 12s. 6d. @ £116 15s. for spot and 17s. 6d. higher for three months, New York is quoted at 25 1/2c.

PLATINUM.

The demand for Platinum is active and prices continue high. We quote for New York \$15.50 per ounce for large lots and \$16 @ 17 for small orders; London is 62 @ 54 can ounce.

POTASSIUM CYANIDE.

Purified, 98 @ 99 per cent., in cases of 120 lb. at 30c. per lb. in 5, 10, 25 and 50 lb tins at an advance.

QUICKSILVER.

The New York quotation remains \$42

per flask. The London price has advanced to £8 5s., with £8 4s. quoted for second hands.

POWDER.

F. o. b., San Francisco: No. 1, 70 per cent. nitro-glycerine per lb. in carload lots, 15 1/4c; less than one ton, 17 1/4c. Black blasting powder in carload lots, minimum car, 728 kegs, \$1.50 per keg. less car lots, \$2 per keg.

COKE.

There has been a quiet trade in coke with a slight improvement reported.

IN CAR LOTS, ST. LOUIS.

Connellsville 6 1/2 coke 72-hr. fix. \$1 70
New River \$1 60 Pocahontas 3 30
Crushed 4 70
Gas works coke, lump, per bushel 10

BORAX.

The San Francisco market in Borax is firm with a good demand, powdered refined in car lots 7 1/2c.

THE MINOR METALS.

Quotations are given below for New York delivery.

Aluminum, No. 1, 99 per cent. ingots, per lb. 18 1/2c
No. 2, 97 " 18 1/4c
Rolled sheets, per lb. 18c up
Aluminum-Nickel, per lb. 18 1/2c
Alum. bronze, 20 @ 23
Bismuth, per lb. \$1 40 @ 1 50
Phosphorus, per lb. 48 @ 50c
Magnesium, 25 @ 30
Tungsten, per lb. 70c
Ferro-tungsten, 60 per cent 60c
Variations in price depend chiefly on the size of the order.

CHEMICALS

The market is bare of domestic goods, while for foreign alkali the demand is slow, owing to the high price.

Caustic soda is quoted for high test, per 100 lbs., f. o. b., works, \$1.42 1/2 @ \$1.45, New York \$1.66 @ \$1.65. Foreign high test is quoted in New York at \$1.60

@ to \$1.70. Jobbers have made sales of domestic alkali around 85c. per 100 lbs. We quote domestic alkali in bags, per 100 lbs. f. o. b., works, at 62 1/2 @ 65. In New York 80 @ 85c. Foreign quoted in New York at 75 @ 80c., per 100 lbs.

Sol-soda is quoted at 50c. per 100 lbs., works, 60 @ 62 1/2c. is offered in New York for foreign. Bi-carbonate of soda is quoted at \$1.12 1/2 @ \$1.25, and for extr \$3.25 @ 3.50 per 100 lbs., works, with \$2.12 1/2 @ \$2.25 offered for foreign. Chlorate of potash, we quote for crystals, domestic \$8.00 @ \$9.25, and for powdered \$9.50 @ \$10.75. Foreign chlorate of potash is quoted in New York, for crystals, \$9.25 @ \$9.50, and for powdered \$10.00 @ 10.25.

CHLORIDE OF LIME.

English prime brands \$1.60 @ \$1.70 American, \$1.70 @ \$1.80; Continental P. \$1.50 @ \$1.60 per 100 lbs.

ACIDS.

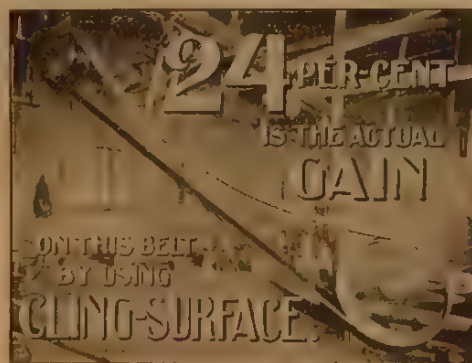
Sulphuric acid is in better request, owing to the warm weather, but blue vitriol is quiet. The other acids are featureless.

BRIMSTONE.

Brimstone is quiet, with no arrivals. We quote for spot, best unmixed seconds, \$21.75 @ \$22.00 per ton, shipment, \$20.50 @ \$20.75. Best thirds are about \$2 less per ton.

NITRATE OF SODA.

Spot is quoted firmer at \$1.92 1/2 @ \$1.65 per 100 lbs. and futures at \$1.60. Consumers, however, anticipate a lower market, as the quiet season is at hand, but the importers are of a different opinion, and do not seem anxious to sell futures at present. 18,000 bags are now due in New York.



BELTS WILL SLIP - BUT

CLING-SURFACE

WILL STOP IT PERMANENTLY.

CLING-SURFACE is to be applied to the inside of a belt.

It has been so universally satisfactory for the past three years that we can safely guarantee that its use will not only stop all slipping, but that the belts will become soft and pliable, yet firm. If of leather, they will become as soft as calf skin, and also absolutely water-proof; and furthermore we guarantee that the belts can be run slack, and that the power will be increased so much that in a fair-sized plant the cost of the sample can will be earned monthly.

This applies to all belts, leather, cotton, rubber or a rope drive, whether new, old, or oily. We will send you a sample can for trial; or, if you prefer, we will advise you further as to its nature.

CLING-SURFACE MFG. CO., 167-172 VIRGINIA ST., BUFFALO, N. Y.

— REPRESENTED IN SALT LAKE BY THE UTAH RUBBER & MFG. CO. —

A Practical Test ...

We asked a man the other day what he thought of our pumps.

"Well," said he, "I've used this pump for twenty years, and it's better than most pumps yet."

The best material, workmanship and patented construction—that's why our pumps wear.

Are you going to buy—Write us for full information and catalogue. All free for the asking.

W. T. GARRATT & CO.,
Pump, Bell, Brass and Machine Works,
135-142 Fremont St., San Francisco, Cal.

Send for Sample Copy of the

Mining and Metallurgical Journal

The Only Exclusive Mining Publication in the West

The Pulsometer Steam Pump

"THE MINER'S FRIEND"

Often Imitated—Never Equaled

Over 20,000 in Use

RECENT IMPORTANT IMPROVEMENTS

The Handiest, Simplest and Most Efficient Steam Pump for General Mining, Quarrying, Railroad, Irrigation, Draining, Coal Washing, Tack-filling and for Pumping Back Liquids heavily impregnated with sediment. Muddy or gritty liquids handled without injury to the Pump.

AGENTS

PARK & LACY CO., A. M. HOLTER BROS. CO., MITCHELL-STAYNER & LEWIS CO.,
San Francisco, Cal. Helena, Mont. Portland, Oregon.



CATALOGUE ON APPLICATION
CORRESPONDENCE SOLICITED

Pulsometer Steam Pump Co.

123 Greenwich Street, New York City

FINANCIAL NOTES.

Average Prices of Metals

In New York per 100 lbs. from January 1st, 1899

Month	Copper	Tin	Lead	Spelter
January	1.15	22.45	4.35	5.34
February	1.15	22.45	4.35	5.34
March	1.15	22.45	4.35	5.34
April	1.15	22.45	4.35	5.34
May	1.15	22.45	4.35	5.34
June	1.15	22.45	4.35	5.34
July	1.15	22.45	4.35	5.34
August	1.15	22.45	4.35	5.34
September	1.15	22.45	4.35	5.34
October	1.15	22.45	4.35	5.34
November	1.15	22.45	4.35	5.34
December	1.15	22.45	4.35	5.34

Average Monthly Prices of Silver.

In New York per ounce Troy, from January 1st, 1899, and for the years 1898 and 1897.

Month	1899	1898	1897
January	59.36	56.77	61.79
February	59.42	56.77	61.79
March	59.42	56.77	61.79
April	59.42	56.77	61.79
May	59.42	56.77	61.79
June	59.42	56.77	61.79
July	59.42	56.77	61.79
August	59.42	56.77	61.79
September	59.42	56.77	61.79
October	59.42	56.77	61.79
November	59.42	56.77	61.79
December	59.42	56.77	61.79
Year	59.42	56.77	61.79

Comparative statement of the circulation in the United States on May 1st 1899. Comparison being made with statement on April 1st 1899.

	May 1, 1899	Apr 1, 1899
Gold	\$ 1,000,000	\$ 1,000,000
Silver	\$ 1,000,000	\$ 1,000,000
Legal Tenders	\$ 1,000,000	\$ 1,000,000
Treasury Notes	\$ 1,000,000	\$ 1,000,000
Totals	\$ 4,000,000	\$ 4,000,000

Gold and Silver certificates and currency are not included in this table. By adding the amounts given in this table with those in the following will give the total amount coined or issued. The

figures herewith are furnished by the Bureau of Statistics Treasury Department.

Comparative statement of changes of money in United States Treasury during April 1899, comparison being made with statement on April 1st, 1899.

	May 1, 1899	Changes.
Gold	\$ 1,000,000	\$ 1,000,000
Silver	\$ 1,000,000	\$ 1,000,000
Legal Tenders	\$ 1,000,000	\$ 1,000,000
Treasury Notes	\$ 1,000,000	\$ 1,000,000
Totals	\$ 4,000,000	\$ 4,000,000

The Gold and Silver certificates in the Treasury is not included in this statement.

Gold and Silver Exports and Imports.

At all United States ports, for the month of April, 1899, and ten months ending April, 1898, and 1899:

	1898	1899
Exports	\$ 1,000,000	\$ 1,000,000
Imports	\$ 1,000,000	\$ 1,000,000
Excess	\$ 1,000,000	\$ 1,000,000

TEN MONTHS ENDING APRIL.

	1898	1899
Exports	\$ 1,000,000	\$ 1,000,000
Imports	\$ 1,000,000	\$ 1,000,000
Excess	\$ 1,000,000	\$ 1,000,000

This statement includes the exports and imports at all United States ports, the figures being furnished by the Bureau of Statistics of the Treasury Department.

WANTS

Advertisements of this class containing not more than five lines will be inserted for not exceeding three months in any one issue at charge to all paid-up annual subscribers. Other than above \$1.00 per month. Advertisements not accepted for less than one month.

COPPER MINING. State full particulars in regard to development work location, distance from water, price of fuel, character of ore and returns from shipments. Must have at least 1500 feet of development work. Send all information possible. Address,

JAMES HOWARD,
Care JOURNAL Office,
150 Nassau St., New York, N. Y.

GOLD mine anywhere in United States, must have at least 1000 feet of development, where coal is not over \$6.00 per ton or wood \$4.00 per cord delivered; plenty of water; no objection to low grade ore if profit can be made by having large plant to amalgamate and concentrate; want 6 months working bond; no property considered unless owners are prepared to deposit a typical check for expenses of engineer if property is not as represented. Address with price and full particulars

J. E. M., Journal Office,
150 Nassau Street,
New York, N. Y.

METALLURGIST and Chemist, ten years experience, assaying, ore buying and smelting, at present engaged with large pyritic smelting company in Mexico. Best's change-meet in the States or British Columbia. Address: "W. H. C." JOURNAL Office.

NOTICE TO STEAM USERS.

The National Association of Stationary Engineers is prepared to furnish Engineers of guaranteed ability for any plant in the city or elsewhere. It is as well Address: J. I. CHAMBERS, Sec'y., Engine Room City Hall, Tel. Main 557 Los Angeles, Cal.

METALLURGIST and experienced Assayer and Chemist with practical experience in Copper and Lead smelting, desires position. Speaks Spanish, highest references, address "Globe", JOURNAL office

EXPERIENCED man desires position, who can install run and repair Steam, Electrical and Mining machinery. Has knowledge of assaying and office work. References. Address: W. H. K., McCLOUD, CAL.

FOR SALE

A GROUP of 4 Copper claims in Northern Arizona. By-product of gold and silver, recently discovered and show great promise will sell at a great bargain. E. R. HOBBSVILLE, DENVER, ARIZ.

REMAIN Two Stamp Steam Mill at Tucson, Arizona. 12 H. P. boiler pump and every thing complete, set up ready for work. In excellent condition, used less than six months. Address DRADING MINING MACHINERY CO. Kansas City, Mo.

ANTIMONY BISMUTH PROSPECTORS having locations of this nature and wishing to sell at once for cash, will do well to address with full particulars, P. O. Box 2078 SAN FRANCISCO, CAL.

A VERY valuable, extensive Lead Mining Property in Southwest Virginia. Shafts sunk over 200 feet and actual work has demonstrated richness of veins and purity of ore. Address: GEORGE FRANK, Baltimore, Md.

FOR SALE AT A BARGAIN.

A 60-TON copper smelting plant, consisting of two 30-ton furnaces, one of which has new, seamless liner. Plant is complete in every detail. Also an 8-ton Silver-Lead Furnace, entirely new, never having been set up. All of the above located immediately adjacent to railroad. Inquire of GARDINER, WORTHEN & Goss, dealers in Mining and Mill Supplies, Tucson, A. T.

The Cleveland Mining and Stock Exchange Co.

New England Building, Cleveland, Ohio.

A Reliable Information Bureau for Miners and Investors to obtain FACTS Regarding Capital and Mines. Stocks and Mines Listed. Send for prospectus.

Morgan-Watson Mining and Construction Co.

800-Rio New England Building, Cleveland, Ohio.

MINES AND STOCKS We Buy, Sell, Lease and Bond Mines of all kinds. We Buy, Sell, and Negotiate sales of mining and other stocks. We furnish machinery to work gold mines under special arrangement. We furnish Capital to develop mines.

JAMES IRVING & CO. REFINERS ASSAYERS

Largest and most complete establishment in Southern California Cyanide and Mill Test.



Must Prices paid for all kinds of ores. Returns made within four hours after receipt.

128 N. Main Street (Old Location.) Los Angeles, Cal.

ALL THE MINING CAMPS OF UTAH AND COLORADO ARE LOCATED ON OR REACHED BY

The Rio Grande Western Ry.

THE SHORTEST, QUICKEST AND MOST DIRECT ROUTH TO

MERCUR AND CRIPPLE CREEK

MERCUR:

The Johannesburg of America, New and Wonderful Camp only 45 miles from Salt Lake City, Utah.

CRIPPLE CREEK:

The Greatest Gold Camp in the World, only six years old and two hundred shipping mines in the district.

P. R. WADSWORTH.

GENERAL PASSENGER AGENT.

Salt Lake City, Utah

ORE TESTING

Complete mill for testing ores on practical scale by all processes to determine the best process adapted to treating any ore submitted. Processes in use investigated to overcome unnecessary losses, etc.

RICKETTS & BANKS.

Metallurgists & Chemists

No. 104 JOHN STREET,

NEW YORK CITY

See

Mining Stock Quotations Page 21

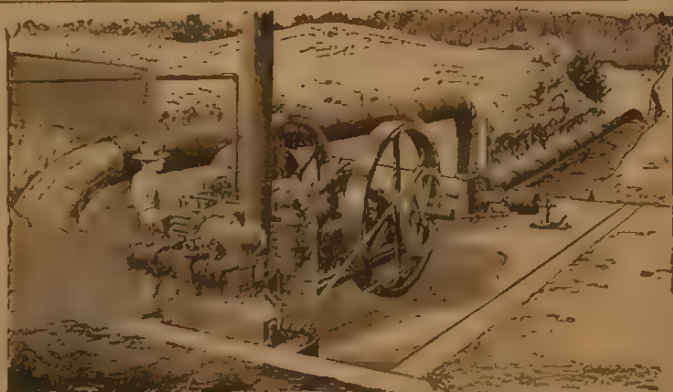
John Wigmore & Sons Co.

MACHINERY

Mine and Mill Supplies, Iron and Steel

117 to 123 S. Los Angeles Street,

LOS ANGELES, CAL.



LARGEST GASOLINE PUMPING PLANT IN THE WORLD

The illustration shows the gigantic pumping plant recently built by the Hercules Gas Engine Works at the Packer Ranch, Colusa Co. 80 h. p. Hercules Engine, pumping 7200 gallons a minute, 27 feet high. Burns Gasoline or Distillate oil. Cheapest power known. Gas, Gasoline and Oil Engines, 2 to 200 h. p. Send for Catalogue. HERCULES GAS ENGINE WORKS, 810 Bay St., San Francisco.

MINING STOCK QUOTATIONS

BOSTON

Adventure	10 00	Mass	11 00
Astoria	4 00	Merced	9 00
Albion	5 00	Mohawk	20 00
Anaconda	50 50	Napa Quicksilver	2 25
Arcturian	16 00	Old Colony Min	10 25
Arnold	13 50	Old Dominion	37 00
Atlantic	32 00	Oreola	38 75
Baltic	31 00	Pioneer	57 50
Bingham	11 50	Placer	2 50
Bonanza	2 50	Quincy	150 00
Boston & Mont	350 00	Rhode Island	7 25
Breece	2 00	Santa Fe	11 37 1/2
Bulle & Boston	77 00	Santa Ysabel	14 25
Calumet & Hecla	750 00	Tamarack	209 00
Catalpa	35	Tecumseh	5 25
Centennial	33 3/4	Tri-Mountain	10 50
Chubb	12 00	Victor	3 50
Copper Range	45 00	Victoria	5 50
Crescent	30	United States	21 00
Dominion Prof	118 50	Utah Mining	45 25
Franklin	18 50	Washington Mine	2 25
Gold Dredging	34 50	White Knob	11 50
Humboldt	2 75	Whitney	13 50
Isle Royale	45 00	Wolverine	45 50
Melones	4 00	Wyandotte	5 50

ROSSLAND, BRITISH COLUMBIA.

Brand'n & G'd Ck	30	Kootenay Gold F.	—
Brit Amer Cor	6 25	Lewick	—
Brit Col Cor	8 00	Lily May	—
Canad G'd Fields	10	London R. C. G. F. S.	00
Cariboo	1 30	London R. C. G. F. S.	00
Commander	—	Monte Cristo	—
Dundee	25	New G'd Fields B. C. S.	00
Evening Star	12	Novelty	—
Fern	50	Queen Des Prop	3 75
Gold Fields of B. C.	00	Rambler Con	35
Hattie Brown	—	Red Mount, View	—
Hall Mines	2 75	Reco	—
Homestake	05	Silver Bell	—
Iron Horse	12	Silver Queen	15
Iron Mask	75	St. Elmo	—
Josie	—	Slocan Star	—
Jumbo	—	Vic. Tr. M. Dev. Co.	—
Kenneth	—	Waverly Mines	—
Keystone	—	War Eagle Con	3 75
		White Bear	10

SAN FRANCISCO.

Alta Con	00	Mexican	48
Andes	11	Occidental	25
Belcher	34	Ophir	1 85
Best & Belcher	45	Overman	17
Bullion	08	Ontario	—
Caladenia	87	Plymouth	—
Challenge	35	Potosi	28
Chollar	28	Quicksilver	—
Confidence	1 00	Quicksilver pref'd	—
Con. Cal. & Va	1 50	Savage	24
Crown Point	28	Seg. Belcher	07
Deadwood	—	Sierra Nevada	68

Gould & Curry	26	Silver Hill	02
Hale & Norcross	24	Standard	2 40
Homestake	—	Union Con	37
Iron Silver	—	Utah	14
Justice	17	Yellow Jacket	30

COLORADO SPRINGS STOCKS

Acacia	06 1/2	Hayden	01 1/2
Alamo	07 1/2	Ingham Con	08 1/2
Altamont	7 1/2	Isabella	7 1/2
American Con	02 1/2	Jack Pot	20 1/2
Anaconda	49	Kimberly	08
Aols	02 1/2	Lexington	08 1/2
Arctidia Con	—	Magnet Rock	28 1/2
Argentum Junata	25	Matoz	28 1/2
Bankers	—	Montreal	—
Banner	01 1/2	Mountain Beauty	04 1/2
Bob Lee	03 1/2	Mollie Gibson	25
Crescent & C. Co.	08 1/2	Moan-Ancor	30
Cripple Crk Con	02 1/2	Mount Rosa	30
Dana	10 1/2	New Haven	02 1/2
Dea Molner	02 1/2	Oriole	04 1/2
Dillon Con	32	Stephen Bell	07 1/2
El Paso	01 1/2	Pharmacist	04 1/2
Emma Almes	01	Pilgrim	04 1/2
Fanny B	00 50	Portland	1 7 1/2
Favorite	—	Pr. Albert	02 1/2
Hindley	11 1/2	Rattler	02 1/2
Pfizer of the West	02 1/2	Specimen	08 1/2
Golden Pledge	31	Theresa	04 1/2
Gold & Globe	04 1/2	Trachyte	04 1/2
Gold King	85	Union	19 1/2
Gould	17 1/2	Vindicator	—
Granite Hill	—	Work	17 1/2

SALT LAKE CITY

Alice	80	Joe Bowers	18 1/2
Ajax	1 20	Joe Bowers B.	07 1/2
Alliance	05	La Reina	90
Anchor	10	Little Pittsburg	01 1/2
Buckeye	31	Lower Mammoth	07 1/2
Bullion Rock	5 75	May Day	95
Cent. Kuraka	51 00	Mammoth	1 75 1/2
Chloride Point	70	Mercer	6 90 1/2
Daisy	30 1/2	Northern Light	55 1/2
Dalton	01 1/2	Omaha	25 1/2
Dalton & Lark	03 1/2	Ontario	7 25
Daily	1 80	Petro	—
Daily West	12 10	Rich. Anaconda	10
Dexter	2 00	Sacramento	45
Eagle	05	Showers Con	37
Eagle & Blue Bell	1 27	Silver King	40 25
Emerald	09 1/2	Star Consolidated	85 1/2
Galena	21	Sunbeam	47
Geyser Marion	49 1/2	Swansea	3 32 1/2
Golden Eagle	03 1/2	So Swansea	1 55
Grand Central	08 1/2	Petro	08 1/2
Homestake	85	Utah	30
Horn Silver	1 35	Valco	81
Ingot	15	West Mtn P'fer	25

NEW YORK.

Adams Con	10	Isabella	80
Alamo	07	Iron Silver	50
Alice	75	Jefferson	51 1/2
Alliance	—	Jennie Blanche	51 1/2
Anaconda	50 00	Justine	02
Anaconda Gold	50	King & Pemh	10
Arctidia	39 1/2	ext. the Cons	08
Argentum Junata	25	Little Chief	17
Belcher	28	Mexican	45
Best & Belcher	60	Mollie Gibson	24
Burt Gold	—	Mt. Rosa	18 1/2
Breece	1 60	Occidental	25
Brenneck	75	Ontario	0 00
Chollar	24	Ophir	1 00
Chrysolite	08	Pharmacist	05
Comstock Tunnel	—	Phoenia	10
Comstock Rocks	04	Plymouth	08
Comstock script	08	Portland	1 60
Con. Cal. & Va.	71	Potosi	30
Cr. & Cr. Creek	00	Quicksilver	2 25
Crown Point	15	Quicksilver pf'd	8 13
Cripple Creek	10	Rocky Mountain	—
Deadwood Terra	50	Savage	20
Dillon	85	Santa Ysabel	1 25
Durango	—	Small Hope	1 25
Good Samaritan	—	Specimen	07
Gold Coin C. Crk	1 85	Standard Con	2 25
Gold Coin Gilpin	35	Synchrato	—
Golden Pledge	35	Union Con	35
Gould & Curry	25	Union	19
Gregory Gold	02 1/2	Utah Con	—
Hale & Norcross	32	Union Gold	—
High Life	24	Victor	—
Homestake	60 00	Work	17
Horn Silver	1 60	Yellow Jacket	39

SPOKANE, WASHINGTON.

Cariboo	1 25	Mountain Lion	1 27
Ben Hur	15	Morison	18
Best Tail	22 1/2	Number Six	12
Bryan and Bewall	05	Pato Alto	14 1/2
Bulle and Boston	17 1/2	Pearl	12
Deer Trail No. 2	20 1/2	Pocahontas	04
Hardman	07	Princess Maude	05
Harvey	07	Quip	12
Kureka First Th't	08 1/2	Rebate	—
Kureka Queen	07 1/2	Republic	20
Golden Harvest	07 1/2	Republic	20
Gold Leaf	05	Republic Big Six	07 1/2
Inaugural	08 1/2	Republic No. 2	08 1/2
Iron Mountain	09	San Paul	82
Jim Haine	28	Sargache	12
Liberty	04	Thoughtful	—
Lone Pine Cons	23	Tom Thumb	15
Merrimac	08 1/2	Trade Dollar	15
Moires	08	Treasury	05
Morning Glory	15	Wendepg	33

DENVER STOCK REPORT.

Aetna	—	Keystone	09 1/2
Anchoria Leland	03 1/2	Little	—
Anaconda	48	Matoz	24 1/2
Arctidia	03 1/2	Mollie Gibson	25
Argentum Junata	25	Moan Anchor	80
Banner	01 1/2	Mt. Rosa	20

Bob Lee	07 1/2	Old Gold	09 1/2
Bonanza	18 1/2	Pilgrim	—
Enterprise	07 1/2	Pine Creek	—
Panor R	00 35	P	1 1/2
Garfield	—	10 1/2 Prince Alb	02 1/2
Gen. Washington	—	Republic	04
Globe P. R.	30	Sacramento	41
Gold Coin	1 80	Savoy	—
Globe & C. Co.	—	Tamarack	06 1/2
Gilpin Four	—	Union	15
Golden Pledge	21	Virginia R	08
Isabella	74	Wheeler Cons.	—
Iron Clad	—	Work	07 1/2
Jack Pot	23 1/2	Work	—

MEXICO

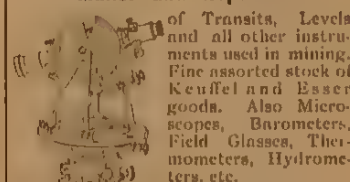
Name of Company	State	Price
Am. and Y. Comorilla	Hidalgo	31
Angustias	Guantanamo	370
Arenal y Anexas	Hidalgo	200
Asturiana y Anexas	Zacatecas	80
Barrados y Cabras	Durango	80
Barinon de Medio	Hidalgo	70
Cabezon y An.	Zacatecas	15
Candelaria de Pinos	Hidalgo	16
Capusay	Durango	30
Cerro	Hidalgo	105
Cerro Bonanza y An.	Guantanamo	100
Concepcion y Anexas	S. Luis Potosi	100
Coronas	Mexico	75
El Oro	Guantanamo	30
El Oro, pref.	Guantanamo	30
Rapansa y An.	Mexico	1,350
Gloria	Chihuahua	50
Guadalupe	Guantanamo	50
Luz de Norte Aviado	Michoacan	22
Luz de Norte Aviado	Michoacan	20
Luz de Maravillas	Hidalgo	180
Pahallon	Zacatecas	20
Palma de Bomb.	Durango	2,000
Pinos	Hidalgo	1,000
Rafael y Anexas	Hidalgo	750
Real del Monte	Durango	70
Real del Monte	Durango	10
San Francisco	Hidalgo	160
San Rafael Aviado	Hidalgo	120
San Rafael del Oro	Hidalgo	65
Ste. Maria de la Paz	S. Luis Potosi	770
Soledad	Hidalgo	37
Union H. Co.	Guantanamo	240
Union H. Co.	Guantanamo	125
Union H. Co.	Guantanamo	110
Union H. Co.	Guantanamo	28
Union H. Co.	Guantanamo	380
Union H. Co.	Guantanamo	57

Note: The above Mexican stocks are figured on the basis of Mexican silver.

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(Stock Transfer Office, Colorado Springs.)

Mines at Victor, Colorado.

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size of the straight line type of Ingersoll-Sergeant Piston

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ago and we purchased of you a Duplex Corliss machine

10" x 18 1/2" x 42 1/2".

This was set in place in our shaft house in the Cripple Creek

District, 10,000 feet above the level of the sea, and was

running continuously ever since, and at times over 100

horses power. The steam cylinders were connected to an in-

dependent jet condenser, for which we are using the mine

water, and the resultant economy of operation is very

noticeable.

The operation of this Compressor is as near perfect as

that of any machine we have ever seen, and this type is well

worth the extra cost on account of the great permanent

economy in operation.

Our mine is equipped exclusively with your drills and we

have only the highest words of praise to give them.

Yours very truly, The Portland Gold Mining Co.,
Jas. A. Burns, President

INCORPORATED MINES PAYING DIVIDENDS.

	NAMES OF MINES	LOCATION	No. of Shares	Capital Stock	Par Value	Amount of last Dividend	Date of Last Dividend	Total Amount Paid in Dividends	Kind of Minerals Produced
1	Aetna Cons.	California	100,000	500,000	5	10	Apr 1899	170,000	G.
2	Alamo	Utah	125,000	125,000	1	02	April 1899	2,500	G, C, I
3	Alaska, Treadwell	Alaska	200,000	5,000,000	25	37½	Apr 1899	4,070,000	G.
4	Alaska Mexican	Alaska	200,000	1,000,000	5	10	Apr 1899	353,031	G.
5	Anaconda	Montana	1,200,000	30,000,000	25	1 25	May 1899	9,750,000	G.
6	Anchorage Leland	Colorado	800,000	600,000	1	03	Apr 1899	198,000	G.
7	American Gold	Colorado	300,000	3,000,000	10	00	Mar 1899	407,000	G, S, L.
8	Argonaut	California	200,000	2,000,000	10	10	April 1899	206,000	G.
9	Associated	Colorado	1,250,000	1,250,000	1	01	Dec 1898	72,000	G.
10	Bald Butte	Montana	250,000	250,000	1	06	May 1899	702,148	G, C, S.
11	Boston & California	California	600,000	600,000	1	06	March 1899	38,000	
12	Boston and Colorado Smelting	Colorado	15,000	750,000	50	5 00	April 1899	375,000	
13	Boston & Montana	Montana	150,000	2,750,000	25	0 00	May 1899	10,775,000	G, C, S.
14	Breece	Colorado	200,000	5,000,000	25	10	June 1899	50,000	I.
15	Bullion Beck and Champion	Utah	100,000	1,000,000	10	10	May 1899	2,368,400	G, S.
16	Bunker Hill and Sullivan	Idaho	300,000	3,000,000	10	07	May 1899	705,000	S, L.
17	Cariboo	British Col.	800,000	800,000	1	01½	Feb 1899	244,965	G.
18	Calumet & Hecla	Michigan	10,000	2,500,000	25	20 00	June 1899	62,850,000	C.
19	Centennial Eureka	Utah	30,000	1,500,000	50	50	May 1899	2,105,000	S, L.
20	Central Lead	Missouri	10,000	1,000,000	100	50	June 1899	112,000	L.
21	Charleston	S. Carolina	10,000	1,000,000	100	2 00	June 1899	200,000	
22	Colorado Smelting	Montana	100,000	1,000,000	10	1 00	Jan 1899	1,915,000	G, S, C.
23	Consolidated Tiger and Poorman	Idaho	1,000,000	1,000,000	1	02	Dec 1898	20,000	G, S.
24	Creston Leasing	Colorado	1,000,000	1,000,000	1	01	Dec 1898	54,000	
25	Crowned King	Arizona	800,000	6,000,000	10	02	Dec 1898	232,000	G, S, L.
26	De Lamar	Idaho	4 0,000	2,000,000	5	12	May 1899	2,946,000	G, S.
27	Deer Trail No 2	Washington	1,000,000	1,000,000	1	0025	May 1899	30,000	
28	Deer Run	Missouri	5,000	500,000	100	50	June 1899	75,000	L.
29	Elkton Consolidated	Colorado	1,250,000	1,250,000	1	01½	Nov 1898	656,951	G, S.
30	Empire State	Idaho	75 000	750,000	10	20	June 1899	165,638	
31	Enterprise	Colorado	500,000	500,000	1	05	Sept 1898	900,000	S, L.
32	Fanny Rawlings	Colorado	1,000,000	1,000,000	1	01	May 1899	10,000	G, S.
33	Ferris-Haggerty	Wyoming	1,000,000	1,001,000	1	00½	Mar 1899	5,000	C, G, S.
34	Geyser Marion	Utah	300,000	1,500,000	5	02	Sept 1898	96,000	G.
35	Garfield Consolidated	Colorado	1,200,000	1,200,000	1	01	May 1899	34,000	G.
36	Golden Star	Ontario, Canada	100,000	100,000	1	01	July 1899	41,000	
37	Gold Coin of Victor	Colorado	1,000,000	1,000,000	1	01	May 1899	200,000	G.
38	Gold King	Colorado	1,000,000	1,000,000	1	02	May 1899	30,000	G.
39	Golden Cycle	Colorado	200,000	1,000,000	5	05	June 1899	198,500	
40	Grand Central	Utah	250,000	250,000	1	15	May 1899	493,750	G, S, C, L.
41	Gain	California	20,000	1,000,000	50	25	May 1899	86,500	G.
42	Highland	S. Dakota	100,000	10,000,000	100	20	May 1899	3,884,718	G.
43	Holy Terror	S. Dakota	300,000	300,000	1	01	Mar 1899	122,000	G.
44	Homestake	S. Dakota	125,000	12,500,000	100	50	May 1899	7,493,750	G.
45	Horn Silver	Utah	400,000	10,000,000	25	05	April 1899	5,260,000	S, L.
46	Idaho	British Col.	500,000	500,000	1	05½	Jan 1899	292,000	
47	Isabella	Colorado	2,250,000	2,250,000	1	08	Feb 1899	405,000	G.
48	Jack Pot	Colorado	1,000,000	1,000,000	1	02½	Mar 1899	25,000	G.
49	Jamison	California	300,000	3,000,000	10	10	April 1899	50,700	
50	Lake Superior Iron	Michigan	84,000	2,100,000	25	1 00	Feb 1899	736,000	I.
51	Lillo	Colorado	1,000,000	1,000,000	1	05	June 1899	224,110	G.
52	Modoc	Colorado	500,000	500,000	1	02	May 1899	130,000	G.
53	Montana Ltd	Montana	660,000	3,300,000	5	12	Apr 1899	2,907,557	G, S.
54	Montana Ore Purchasing	Montana	40,000	1,000,000	25	1 00	May 1899	1,120,000	
55	Morning Star	California	2,400	240,000	100	2 50	May 1899	726,600	G.
56	Mercur	Utah	200,000	5,000,000	25	12½	Jan 1899	1,266,000	G.
57	Mammoth	Utah	400,000	10,000,000	25	05	Dec 1898	1,350,000	G, S, C, L.
58	Muton	Colorado	1,000,000	1,000,000	1	02½	Dec 1898	25,000	G.
59	Mead	California	2,000,000	2,000,000	1	20	Mar 1899	100,000	G.
60	Monument	Colorado	300,000	300,000	1	01	Dec 1898	12,624	
61	Moulton	Montana	400,000	2,000,000	5	05	Feb 1899	480,000	
62	Mt Shasta	California	20,000	100,000	5	30	May 1899	8,000	
63	New York & Hon. Rosario	Central A.	150,000	1,500,000	10	10	May 1899	1,050,000	S, G.
64	Napa	California	100,000	700,000	7	20	Apr 1899	900,000	G.
65	New Idria Quicksilver	California	100,000	500,000	5	20	Apr 1899	120,000	G.
66	North Star	California	200,000	2,000,000	10	25	Apr 1899	550,000	G.
67	Ophir Hill	Utah	1,000	25,000	25	20 00	Dec 1898	20,000	
68	Original Empire	California	50,000	5,000,000	100	1 00	May 1899	500,000	G.
69	Oscoda	Michigan	50,000	1,250,000	25	3 00	June 1899	2,801,500	C.
70	Parrot	Montana	230,000	2,300,000	10	1 50	May 1899	2,600,898	C.
71	Pennsylvania Consolidated	California	51,500	5,150,000	10	05	June 1899	67,100	
72	Pioneer	California	100,000	1,000,000	10	12½	Mar 1899	62,500	G.
73	Portland	Colorado	3,000,000	3,000,000	1	02	June 1899	2,197,080	G, S.
74	Plumbago	California	300,000	300,000	1	15	Jan 1899	45,000	G.
75	Quicksilver Prof	California	43,000	4,300,000	100	50	May 1899	1,845,411	G.
76	Quicksilver Consolidated	California	57,000	5,700,000	100	40	July 1899	843,867	G.
77	Quincy	Michigan	100,000	2,500,000	25	3 50	Feb 1899	10,470,000	C.
78	*Republic Consolidated	Washington	3,000,000	3,000,000	1	01	June 1899	188,000	G.
79	Raebler-Cariboo	British Col.	1,000,000	1,000,000	1	01	April 1899	50,000	
80	Royal Consolidated	British Col.	2,500,000	2,500,000	1	01	Mar 1899	25,000	G.
81	Sacramento	Utah	1,000,000	5,000,000	5	00½	June 1899	87,500	G.
82	Small Hopes Consolidated	Colorado	250,000	5,000,000	20	10	Feb 1899	3,325,000	S.
83	South Swansea	Utah	150,000	150,000	1	05	Apr 1899	147,500	S, L.
84	Standard	Idaho	500,000	500,000	1	08	Apr 1899	1,715,000	G, S.
85	Standard	California	200,000	20,000,000	100	10	May 1899	3,859,226	G, S.
86	St. Joseph	Missouri	30,000	3,000,000	10	1 50	Mar 1899	2,822,000	L.
87	Silver King	Utah	150,000	3,000,000	20	25	May 1899	2,975,000	S, L, G.
88	Smuggler	Colorado	1,000,000	1,000,000	1	01	June 1899	1,155,000	S, L, Z.
89	Swansea	Utah	100,000	600,000	5	05	May 1899	161,500	S, L.
90	Tamarack	Michigan	60,000	1,500,000	15	4 00	June 1899	5,910,000	C.
91	Tomboy	Colorado	200,000	2,000,000	10	4 00	May 1899	730,000	G.
92	Utah	Utah	100,000	1,000,000	10	02	Jan 1899	179,000	G.
93	Vindicator	Colorado	1,500,000	1,500,000	1	05	Apr 1899	208,500	G.
94	War Eagle	British Col.	2,000,000	1,000,000	1	01½	May 1899	309,000	
95	Wolverine	Michigan	60,000	2,500,000	25	1 50	Apr 1899	150,000	C.
96	Yellow Aster	California	100,000	1,000,000	10	10	May 1899	203,789	G.

B. Silver; G. Gold; L. Lead; C. Copper; Q. Quicksilver; I. Iron; Z. Zinc.

N. B.—Companies not listed have not paid a dividend for the last twelve months.

*Paid since consolidation \$63,000; Republic paid \$120,000 under old management.

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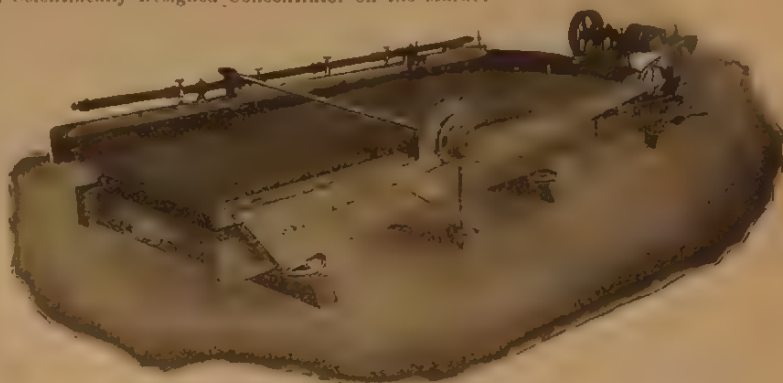
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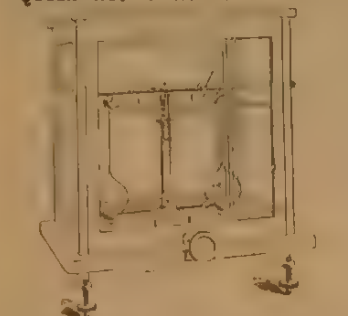
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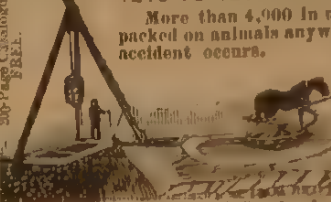
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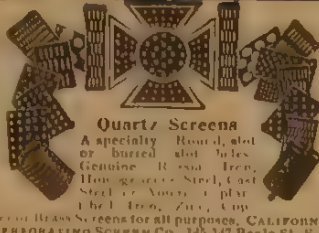
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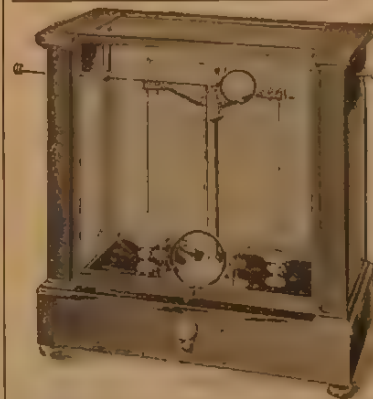
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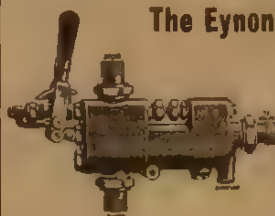
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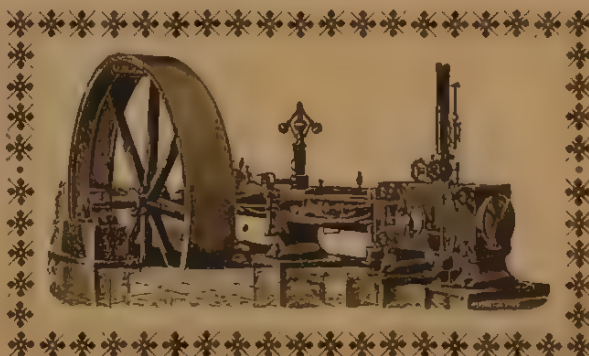
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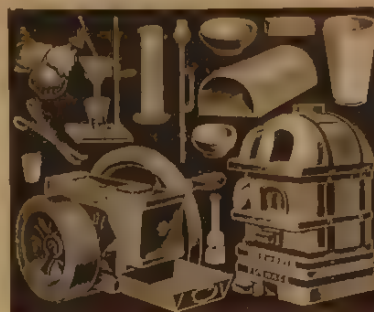
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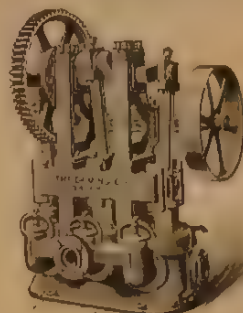
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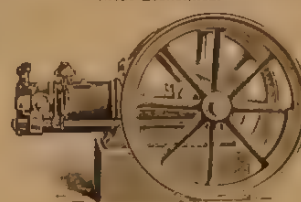
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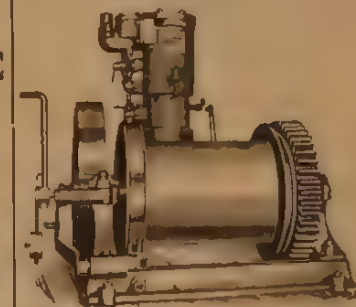
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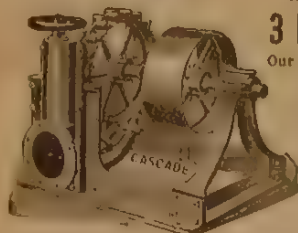
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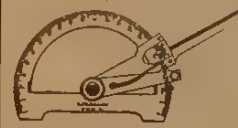
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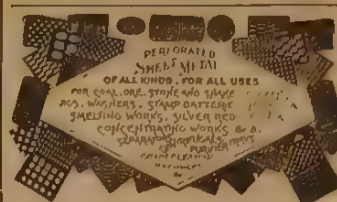


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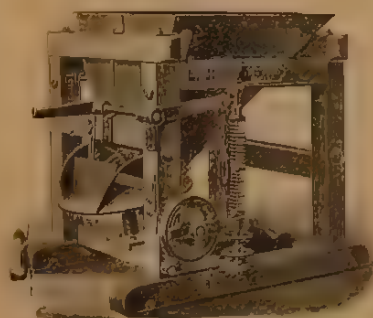
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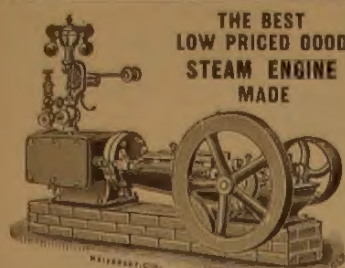
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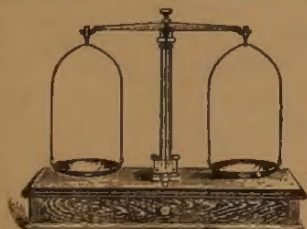
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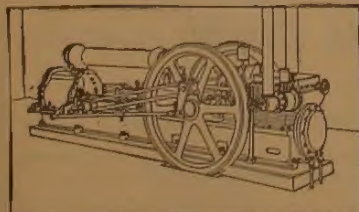


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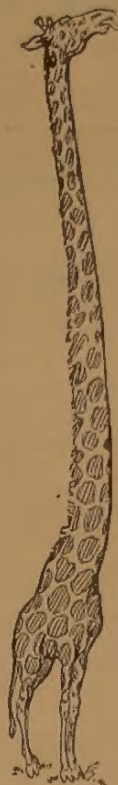
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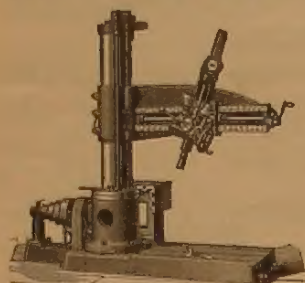
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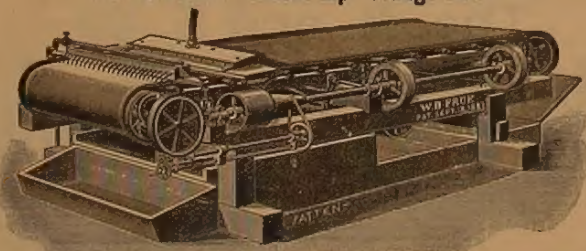
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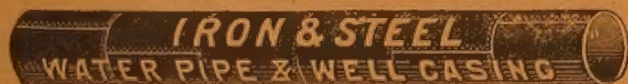
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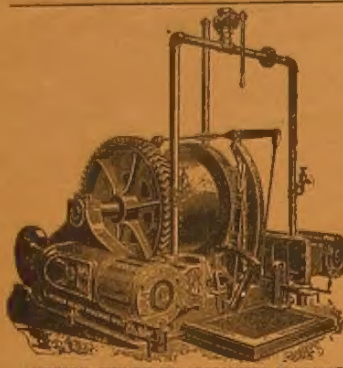
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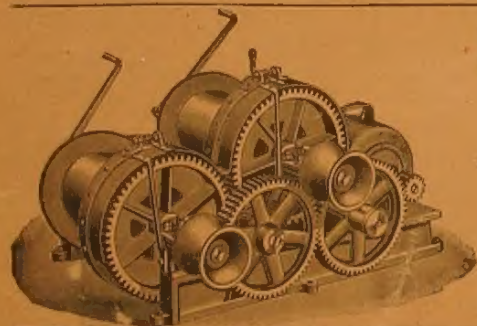
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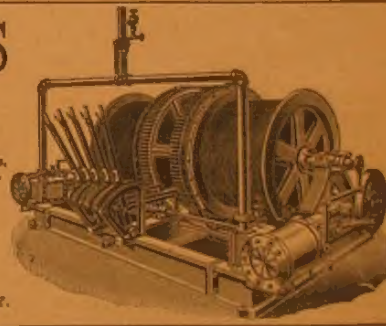
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